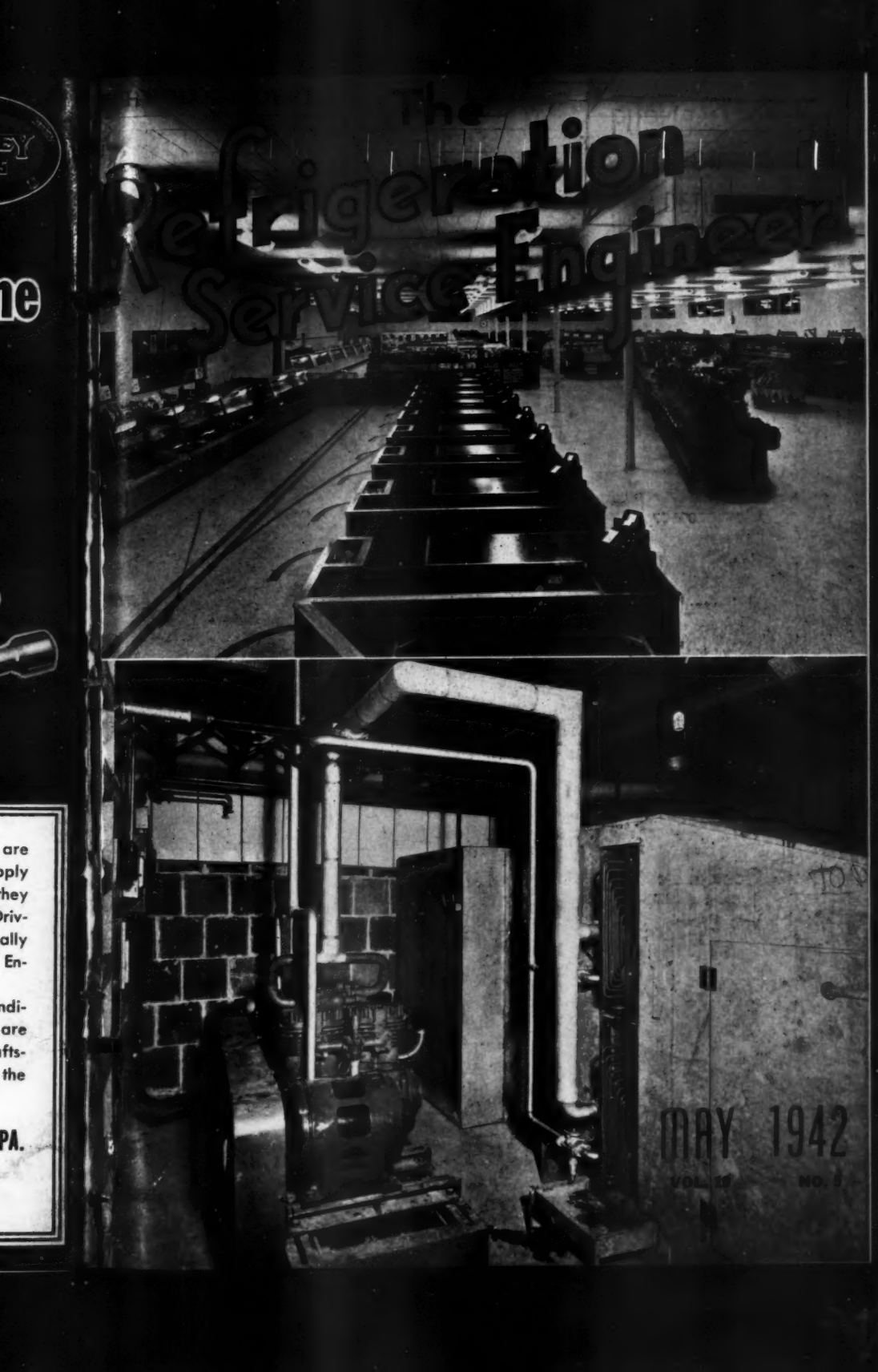
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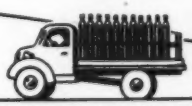

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A. B. Schellenberg

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President

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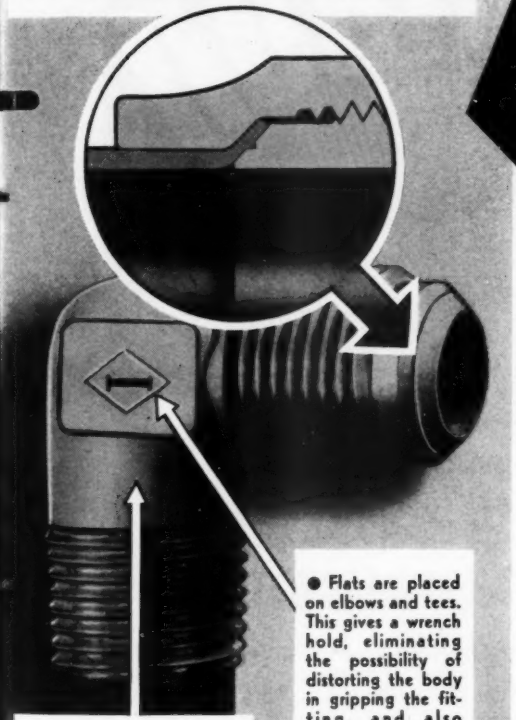

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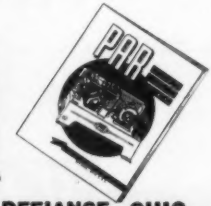

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The Refrigeration Service Engineer

Vol. 10 No. 5

May, 1942

A Monthly Illustrated Journal Devoted to the Interests of the Refrigeration Service Engineer in the Servicing of Domestic and Small Commercial Refrigeration Systems and Oil Burners

Official Organ
REFRIGERATION SERVICE ENGINEERS SOCIETY

Cover

See article on page 25

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MANPOWER AND MATERIALS
KEYS TO NATIONAL DEFENSE
-they must be conserved

Defense requirements must come first. Demands are heavy—will be heavier—and they must be met. Hence, it is a patriotic duty to conserve manpower and materials—the twin keys to National Defense.

In laying out refrigeration and air conditioning installations, it is necessary to consider these factors. As the army grows—capable service men will be fewer—the answer is equipment that requires minimum service. If equipment is ineffective and has to be replaced, added and unnecessary loads are thrown on production machines needed for turning out military supplies. Additional materials must be used which may be needed elsewhere. Select equipment that won't have to be replaced.

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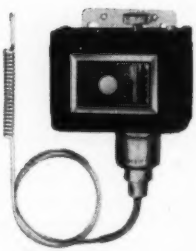

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The Refrigeration Service Engineer

Vol. 10, No. 5 CHICAGO, MAY, 1942 $2.00 Per Annum

P-126 Is New Refrigeration Repair and Maintenance Order

New Order Provides for Preference Ratings for Air Conditioning and Commercial Refrigeration Equipment to Service Agencies Granted Serial Number by the War Production Board. No Preference Ratings Given to Household Refrigeration.

P-126 is the "order of the day" for the refrigeration service field. This number will become the familiar designating mark for the refrigeration service and maintenance man in securing repair and replacement parts. The order is officially titled "Preference Rating Order No. P-126—Material for Emergency Servicing of Refrigerating and Air Conditioning Machinery and Equipment."

The effective date was April 20, 1942. The expiration date is June 30, 1942. However, the majority of War Production Board orders are automatically extended at the expiration date.

For convenience in interpreting, the order may be considered in eight sections:

(a) *Definitions:* A mechanical refrigerating system is defined, excepting, however, a domestic mechanical refrigerator. The agencies which the order covers are also defined.

(b) *Assignment of Preference Ratings:* This section provides for the application of three preferential ratings, namely, A-1-a, A-3, and A-8.

(c) *Persons Entitled to Apply Preference Rating:* Defines the agencies entitled to use the order.

(d) *Restrictions on Use of Rating:* Specifically designates certain critical materials for which the preference ratings cannot be used.

(e) *Restrictions Upon Application of Preference Ratings:* Outlines the procedure for the service agency to secure the War Production Board serial number, and the manner of endorsing orders issued to a supplier.

(f) *Records:* Outlines the provision for retaining orders issued under P-126 for a period of not less than two years.

(g) *Reports:* This section provides for the furnishing of reports when required by the War Production Board.

(h and i) *Communications and Violations:* Provide for the violations if the order is misused or misapplied.

No Ratings for Household Refrigerators

At the present time no orders have been issued that will allow the use of any preference rating on the securing of parts and supplies for domestic refrigeration. It is hoped that such an order may be forthcoming because the situation can become

critical this Summer. The Government has indicated on numerous occasions its desire that existing equipment be maintained in good operating condition. As has been pointed out in previous reports, the expenditure of a very nominal amount will provide for the protection of millions of dollars worth of household refrigeration equipment. Usually the major job of household service is a matter of labor, and parts and supplies are usually a minor part of the work.

Serial Numbers to Be Issued by WPB

Late advice from the War Production Board indicates that no applications for the service agency serial numbers will be issued from that office. The service agency is required to have its name filed with the War Production Board as an authorized service agency of a manufacturer, owner or lessee.

Method of Securing Serial Number

Manufacturers of compressors, coils, cases and coolers, have been asked to supply a list of their authorized service agencies to the Air Conditioning and Commercial Refrigeration Branch of the War Production Board, and it is the duty of the emergency service agency to immediately see that its name is furnished through either one of the manufacturers of this equipment to the War Production Board. No serial number will be issued by the War Production Board to any service agency that is servicing household refrigeration equipment exclusively.

After the names of the service agencies have been presented to the War Production Board, a questionnaire will be sent to the service company—P-899—which will be considered by the War Production Board, but the filing of this application does not necessarily mean granting of a serial number.

Emergency Service Inventory

A provision in the order specifically states what "an emergency service inventory" comprises. This means the *minimum* inventory of material required to supply current demands for emergency service. Such minimum inventory shall not exceed the maximum physical quantities of similar items on hand for similar purposes on the date of any physical inventory taken in the year 1941. Separate dates for different items may not be chosen. This clause provides for the necessary parts stock in the shop and service car.

Preference Ratings

Preference rating A-1-a is used for securing parts and supplies for the servicing and maintenance of any *industrial* refrigeration and air conditioning equipment:

(b) (1) (i) Used primarily for the processing, transportation and storage of food and dairy products for the Army or Navy of the United States or the United States Maritime Commission;

(b) (1) (ii) In cold storage warehouses;

(b) (1) (iii) In meat-packing houses under the inspection of the United States Government;

(b) (1) (iv) In blast furnaces.

The A-1-a rating can only be used when an actual breakdown to the refrigeration equipment enumerated above has occurred.

An A-3 rating can be used to secure repair parts and supplies to avert an immediately threatened breakdown or suspension of operation of any type of refrigeration or air conditioning equipment coming under the above four classifications.

The A-3 rating is also used:

(b) (2) (ii) When, and only when, there has been an actual breakdown of refrigerating or air conditioning equipment used

(a) For the processing, transportation or storage of food and dairy products (except when coming under the provisions of subparagraph (b) (1), including (but not limited to) all such equipment in retail establishments where food is sold or served, but excluding domestic mechanical refrigerators; or

(b) In manufacturing plants (other than blast furnaces) actually engaged in manufacturing products under a Defense Order as defined in Priorities Regulation No. 1, where the proper functioning of such equipment is necessary to the completion of such Defense Order.

A rating of A-8 is extended in order to secure repair parts or supplies.

(i) To avert an immediately threatened breakdown or suspension of operation of any types of refrigerating and air conditioning equipment coming under the provisions of subparagraph (b) (2) (ii);

(ii) For emergency service to all other refrigerating and air conditioning equipment (except any domestic mechanical refrigerator), and

(iii) When such deliveries are needed to maintain an emergency service inventory.

(Continued on page 38)

Conserving the Refrigerator

Timely Hints for Keeping Refrigerators Going

By L. K. Wright, M.E.

THE Government is asking people to conserve electricity, so that greater war effort can be made. Recently, the manufacture of new refrigerators was sharply curtailed, which will make it difficult or even impossible to obtain a new refrigerator if the old one cannot be repaired and kept running. Today many families have had one or more members leave the family circle, to enter the armed forces or to work in factories in distant cities. The woman of such a household will find her refrigerator not subjected to the load it previously had to carry. In such a case there is a simple way of reducing the refrigerating load on the apparatus, resulting in the use of less electricity, naturally less cost of operation, and because the machine will run much less it will mean that same machine will last much longer. Preventing undue wear on the machine may mean such apparatus will still be running when the war ends, and then the user will be glad to purchase a new one. In the meantime it will have functioned perfectly and the food entrusted to it will have been held in a thoroughly edible condition.

Role of Refrigeration

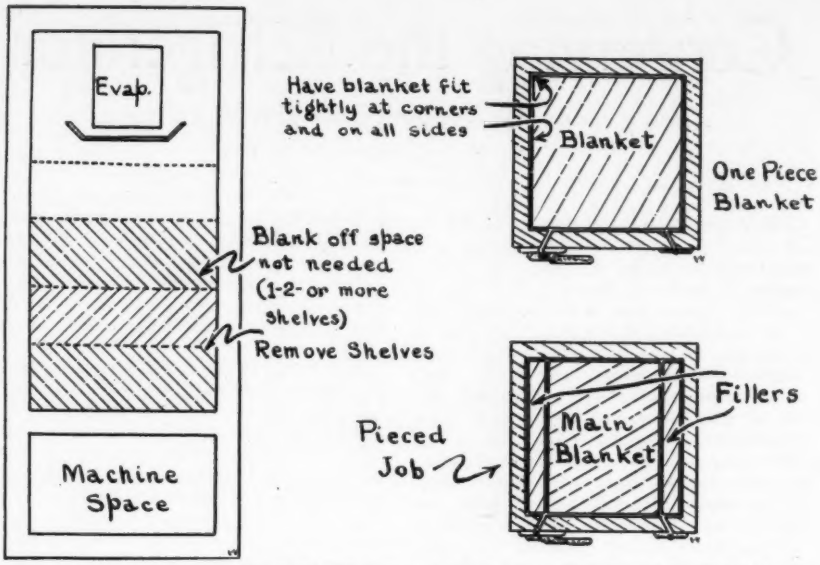
People do not seem to realize that refrigeration plays a most important part in this or any war. It makes possible the storage of an entire crop and makes food products available all the year round. This in turn keeps the price down on food and gives us a varied diet. Varied diets mean healthy citizens; people who can work and produce at top speed and work long hours. Today nearly all our foods have been refrigerated, either during transportation or pending consumption. No other process of food preservation can approach refrigeration, for by this method nothing is added or extracted from the food. The original appearance, consistency, vitamin content and edible qualities are maintained without alteration. In many cases refrigeration brings about a desirable ripening and enhances the food values. Yes, refrigeration is important to our civilization. If something happened to upset the laws of nature, upon which our refrigerating processes depend, we would find our cities empty shells, devoid of people, for the population would have streamed into the countryside in search of food.

New York City, in 1941, consumed a daily average of 40,000,000 pounds of food. This food was for the most part fresh products and required some 1,650 freight cars to convey it to the city. Such a string of cars would be about 15 miles long. Imagine the refrigeration necessary to hold our food supplies, even for a short period of time. Refrigeration has an important role to play, in war and in peace.

Little New Apparatus

The American housewife has been accustomed to shoo away salesmen selling vacuum cleaners, dish washers, ironers, refrigerators, and other products. All she had to do was to sign on the dotted line and within twenty-four hours the machine was delivered. Those days have disappeared, no longer can you merely telephone or go to a dealer and have him send in a machine.

Refrigeration men are required to service machines and their job is getting harder every day. American ingenuity will be taxed to its utmost, for it appears that servicemen will have to wrack their brains to find new ways, new substitutes, or methods of refinishing parts which were previously merely replaced. It follows then, that servicemen should be interested in keeping machines running during this trying crisis which formerly would have been condemned and replaced. One of the ways the small household box can be made to last longer is to take newspapers, books, or magazines and fill up the lower space,—the space not used at present, yet which costs money to maintain in a cold condition. Just like keeping unused floors or bedrooms heated in the winter, the practice of keeping the entire refrigerator cool when only a part of the space is used is a pure waste.



Illustrated here are three methods of blanketing off unused parts of a refrigerator which will help to save current as well as reduce wear on the machine.

Blank Off Unused Space

One or two of the lower shelves can be packed with paper, arranged neatly and tightly, and covered with waxed paper or oil cloth, so that anything spilled can be easily wiped up. Again, a waterproof covering will prevent the paper filling from becoming damp. Dampness will cause an odor to develop and, of course, somewhat defeat the purpose, for damp insulation will conduct heat more readily than the dry material.

In many cases as much as half the refrigerator can be blanked off by this method and result in a reduction of possibly sixty per cent of electricity, for there will be very little heat flow through this new bottom insulation.

Where the refrigerator model is one of the type having the machine in a space below the box, the saving will be higher, but in all cases it will be appreciable. Insulation manufacturers might be induced to produce blanket types of assemblies that could be pressed into place snugly. These blankets could be made in six inch thicknesses, so that one, two or more layers could be placed in the refrigerators, depending upon the space desired to be blanked off. Having waterproof envelopes they would last as long as the refrigerators. The idea is such that they could even be used in peace time, such as during the summer months where some of the family are away on vacation and when little food is kept in the box.

Fitting Blank-Off

Servicemen could make up blank-off sections by using corrugated paper and forming the main square of this material, providing a waxed paper covering. The sides and front could be patched with smaller sections, unless the serviceman wants to tailor each blanket for the particular box.

Bear in mind the door opening is usually smaller than the inside of the box and a certain amount of flexibility is desired so that the blanket fit the space tightly. A snug fit must be obtained at corners and edges.

Keep Condensers Clean

As a further aid to reduction in electric consumption, instruct the woman of the household to periodically pull the electric plug and then clean the condenser of all lint and dust, so that maximum heat dissi-

pating action can be obtained from the condensers. Check head pressures on all jobs and hold them to the proper point, dependent upon back pressure, refrigerant, and room temperature. Use the chart available for the purpose. Bear in mind that a higher head pressure first involves greater electric consumption; second, that the higher head pressure makes the compressor less efficient, for there is greater re-expansion of gas that is left in the compressor at the end of the compression stroke, and therefore less gas removal from the evaporator per stroke of the piston.

Back Pressures

Check the back pressures. See that the expansion valves have been set so that the entire evaporator is frosted when the thermostat kicks off. If not entirely frosted, raise the back pressure. The most economical point is that back pressure which is the highest you can use, without frosting out on the suction line.

Temperatures

Check the box temperatures. Keep the household box between 42° and 46° F. Lower temperatures are not necessary for the average home, for food is not stored for any great length of time and does not require lower temperatures. Check the thermostat settings and see that the range is fairly wide. A machine operating with a narrow range will run more often, and bills will be higher. Remember, like the automobile, more power is required to get the apparatus started than will be needed after it is moving. Start and stop an automobile every few blocks and you will find high gasoline consumption. The same with the refrigerator; except of course it uses electricity—try to have a wider range for the operating period. There will be less starts per 24 hours and less current consumed.

Saves Shelves

The illustrations indicate some ideas covering the use of insulation to blank off the space not used or needed. The shelves not used may be removed and stored away, in the event that more or all the original storage space is again required.

Caution is advised in placing food in the box. Bear in mind convecting currents must move freely in the refrigerated space, so food must not be packed in tightly.

Coldest Spot in Nation at Douglas Aircraft Plant

TO make sure that the camouflage on the great dive bombers, which are flown in the stratosphere until their objective is reached, will not peel off because of the change in temperature from that of 36,000 feet in the air to that of the earth's surface, the Douglas Aircraft Company has built the "coldest refrigerated room in America" at their blackout plant in Santa Monica, California.

A problem in construction of the high-flying planes, according to designers of the company, was that upon reaching warmer temperatures after flying in the intense cold of 67 degrees below zero in the stratosphere, the paint would chip and fly off the metal of the plane, due to the contraction and expansion under the changes of temperature. Also, controls passing through small apertures would "bind" and make the big bomber unmanageable until warmer air allowed them to expand. To make matters worse, lubricating oil in the motor, bomb-turret electric motors and other moving parts would stick fast in the severe cold.

To overcome these handicaps, the Douglas plant built a refrigerated test room in which the thin-air and sub zero temperatures of the stratosphere could be simulated on the ground. Here, metals, alloys, plastics, paints, glass, oils, and small moving-parts equipment are tested to determine the shrinkage coefficient of each and to allow for it. Part of the room includes complete facilities to test fuel, oil, hydraulic pressure equipment, insulation, suit heating, bearings, pumps, gears, machine gun mechanisms, etc. Compensating improvements for the cold mean that a pilot whose bomber is a menacing instrument of death at 20,000 feet will not find himself powerless to maneuver at 36,000 feet.

The test room is a small chamber 14x16 feet in the center of one of the windowless blackout factories, insulated by one foot of fibrous spun glass and cork, and with sealing doors. The temperature can be reduced to 104 degrees below zero in two hours' time from the 80 above zero temperature prevalent in the air conditioned plants. The low-side is a series of cold plates through which are circulated carbon dioxide and methyl alcohol, agitated together under pressure by a centrifugal pump. The mixture, passed through a heat exchanger battery, quickly

drops the temperature 180 degrees if desired, faster cooling than can be accomplished by any other method, according to plant engineers. Exclusive of liquid air and other laboratory experiments, the room produces the coldest temperature anywhere in the country.

Woolfleece lined flying suits, electrically heated for stratosphere flying, have been developed in this room, as well as non-freeze control wires which pass through plastic materials of the same coefficient as the metal wire. It has also been demonstrated in this room that rubber hose connections, no matter how constructed with fabric ply, will snap and crack open at these temperatures. Tires which wear out in a few landings because of these conditions are now being replaced by a type which will withstand a temperature of 150 degrees below zero.

New Equipment Improvements for Heavy Business Ahead

By DONALD DELAYEN

"THE last word" in efficient modern equipment for all branches of commercial and domestic refrigeration service has been installed by the Reliable Service Company of Baltimore, Maryland, to enable the company to turn out more reconditioning work in its own shop with fewer men than in the past. "The labor problem is bad because of the demand for maintenance engineers and refrigeration installation crews in defense building around the city," an executive said, "so that we are transferring many operations which formerly required a manual supervision to automatic machines. We hope to speed up the operations concerned by 50% and to thus alleviate to some extent the labor problem when 1942's heavy service load begins."

Reliable Service Company operates a modern shop for repairing and reconditioning of commercial refrigerating compressors and condensers, and for domestic electric refrigerators, washing machines, and similar appliances. It also has built up a profitable "sideline" since the beginning of the war with the refinishing of small appliances such as roasters, table appliances and water coolers, which are being brought in by Baltimore housewives through a cooperative advertising plan by refrigeration service dealers and the local utility—aimed at keeping the appliances of today operating tomorrow at full efficiency.

Recently the shop was put through a complete remodeling program. Large doors were cut through the wall for bringing in by truck of larger pieces of commercial equipment, an overhead crane and pulley arrangement built in for moving heavy equipment from place to place. Most important, according to the management, are two electrically-heated equipment innovations for cleaning and drying appliance parts, which was formerly a "bottleneck" in the shop which prevented more important work from being done.

The first electric heating unit solved the problem of cleaning off old lacquer and enamel from refrigerator cabinets before refinishing. Instead of boiling in a large open tank these are now cleaned in a closed tank equipped with two five-kilowatt General Electric heaters installed in the bottom of the tank. The immersion type heaters hold the caustic soda cleaning solution at a temperature of between 200° and 212° F. while under heavy and continuous use. Controlled automatically, both heaters are used to bring the caustic solution up to temperature, then one unit is sufficient to maintain the temperature for best results thereafter. The tank goes into operation early in the morning, and is maintained at around 205 degrees through the day, cleaning off old paint and lacquer in about one-third the former time required with the open tank and a gas flame. Reliable Service Company now tears down each domestic refrigerator as soon as received, routing the mechanism to one section of the shop, the cabinet to another for reconditioning. In some instances where boxes are reconditioned for dealers, the refrigerating units and cabinets are being "transposed," using parts of one unit to modern-

ize another. Many extra refrigerators of saleable condition have thus been turned out.

A second improvement is an electrically-heated baking oven which vastly speeds up the operation of removing moisture from refrigerating coils in both commercial and domestic equipment. Before this equipment was installed, the Reliable Service Company experienced frequent occasions on which the moisture from coils improperly dried caused expensive repairs and the need for new coil sections—and of course, a good deal of customer dissatisfaction. Formerly coils were dried by exposure to fan-driven air over a period of several days.

Under the new system, a specially designed oven, equipped with seven kilowatts of miniature electric heaters, provides a temperature of 230° F., extremely dry heat which will dry out coils perfectly in a few hours. At this temperature, any moisture in the coils of any type is quickly vaporized and drawn out. The oven is 9 feet long by 5 feet deep, completely insulated, and has double doors which open full length to admit a large piece of refrigeration equipment without tearing it down. A vacuum pump is housed on the top of the cabinet, connected to the coil being dried, and draws out the moisture as quickly as it vaporizes. A recorder demonstrates when the unit is ready for recharging, and it takes only a few moments to remove one set and substitute another. Operation is entirely automatic, leaving the mechanic who formerly had to inspect the oven every few minutes free to do other work. Refrigerator mechanisms are now being baked "whole" for more rapid turnout—saving hours of time.

Use of this new equipment, in addition to more efficient all metal work benches, power tools where possible, and air conditioning of the service shops, has enabled Reliable Service Company to add 35% more operating efficiency in two or three months, according to the management. The company is advertising aggressively for service and reconditioning customers in Baltimore, and if the customer needs any "convincing" that the firm is qualified to do a 100% reconditioning job, takes her on a "plant tour" through the clean, handsome service shop itself.

Service Data on The Brunswick T.A. Fountain

THE refrigeration for the Brunswick-Balke-Collender soda fountain is furnished by means of three individual circuits, namely: (1) Brick and Bulk Compartment; (2) Dry Storage and Syrup Rail; (3) Brunswick Instantaneous Cooler. These circuits are connected together in the upper back of the dry storage compartment to a common suction and liquid line.

Brick and Bulk. Liquid refrigerant goes from the heat interchanger, located in the dry storage compartment, through ¼ inch copper tubing to the Peerless Model VM-4, .047 inch orifice expansion valve if Methyl Chloride is used or the Model VF-7, .078 inch orifice expansion valve if Freon is used, which is located in the upper left hand corner of the dry storage compartment, and from here into a ⅝ inch copper tubing across the top of the back of the bulk storage liner and then is spirally wound down the brick storage compartment liner. The expansion coil then continues to the top of the bulk storage compartment liner spiralling down it and goes from here to the check valve located in the dry storage compartment through the heat interchanger and out to the suction service valve.

Dry Storage Compartment and Syrup Rail. Liquid refrigerant goes from the heat interchanger through a ¼ inch copper tube to the Peerless Model VM-4 expansion valve, if Methyl Chloride is used, and Model VF-7, if Freon is used, located in the extreme end top corner of the syrup rail above dry storage compartment. The refrigerant then expands down through a ⅜ inch copper tube to the back of the dry storage liner across the bottom of the liner and up to the top of the front of the dry storage liner, then down the front of the dry storage liner and into the bottom of the syrup rail expansion coil from which it goes back into the dry storage compartment to the temperature

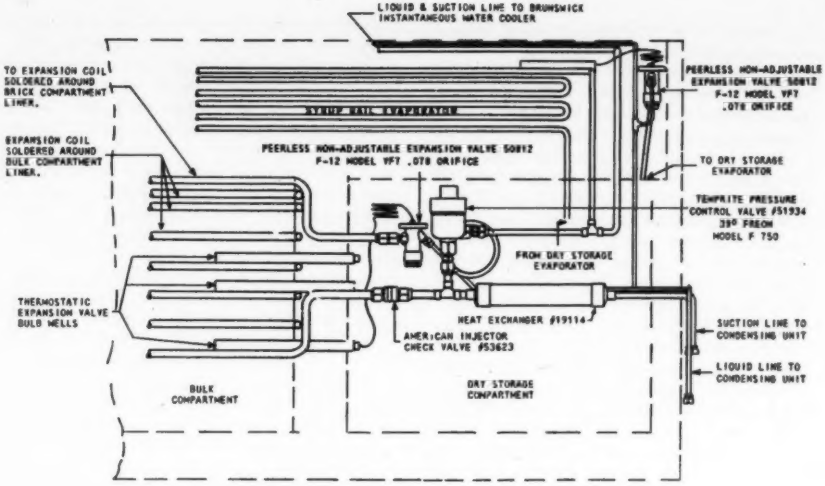

LIQUID & SUCTION LINE TO BRUNSWICK INSTANTANEOUS WATER COOLER
TO EXPANSION COIL SOLDERED AROUND BRICE COMPARTMENT LINER.
EXPANSION COIL SOLDERED AROUND BULK COMPARTMENT LINER.
SYRUP RAIL EVAPORATOR
PEERLESS NON-ADJUSTABLE EXPANSION VALVE 50812 F-12 MODEL YF7 .078 ORIFICE
PEERLESS NON-ADJUSTABLE EXPANSION VALVE 50812 F-12 MODEL YF7 .078 ORIFICE
TO DRY STORAGE EVAPORATOR
TEMPRITE PRESSURE CONTROL VALVE #51934 38° FREON MODEL F 750
FROM DRY STORAGE EVAPORATOR
THERMOSTATIC EXPANSION VALVE BULB WELLS
HEAT EXCHANGER #19114
AMERICAN INJECTOR CHECK VALVE #53623
SUCTION LINE TO CONDENSING UNIT
LIQUID LINE TO CONDENSING UNIT
BULK COMPARTMENT
DRY STORAGE COMPARTMENT

Fig. 1—Refrigeration circuit of the T.A. Creamer.

regulating valve, and located in the dry storage compartment, and then through the heat interchanger to the suction service valve. These circuits may be traced in Figs. 1 and 2.

Brunswick Instantaneous Cooler. Liquid refrigerant from the heat interchanger is fed through a ¼ inch copper tubing into the syrup rail and along the back of the syrup rail up the front of the Brunswick instantaneous cooler to the liquid service valve. The suction line from the Brunswick instantaneous cooler follows the same path back to the dry storage compartment and is teed into a common line with the syrup rail expansion coil before entering the Temperature Regulating Valve.

Bulb Locations. Bulb wells are constructed in the bulk storage liner located on top of bottom, third and fourth passes from the bottom. The bulb well for the syrup rail and dry storage compartments is located in the front lining of the syrup rail above the dry storage compartment.

Carbonated and Sweet Water

In order to cool water at the fountain, a Brunswick instantaneous cooler is placed at the draught station. Refrigerant control for this cooler is accomplished by means of an open bucket type float valve. Suction and liquid lines are run from the cooler to the heat interchanger assembly and temperature regulation is accomplished by the use of a temperature control valve, mounted in the dry storage compartment.

Salad Unit

In some installations, a mechanically refrigerated salad unit may be installed adjacent to the fountain. This unit is a small counter type refrigerator with a sweet water bath, salad pans in the top, and a refrigerated storage space for foods and salad materials located in the lower part of the unit. The refrigerated section has a fin coil installed in the dry storage section and an exposed copper tube coil is soldered to the bottom of the salad unit. The coils are connected in series, and refrigerant control is accomplished by the use of a thermostatic expansion valve with the temperatures governed by the use of an M900 (for Methyl) or F900 (for Freon) temperature regulating valve. The temperature regulating valve is mounted outside of the unit and hand shut-off valves are provided for both the liquid and suction lines. Each Brunswick soda fountain is connected to a compressor of the proper size in the test department at the factory and the entire equipment for the fountain installation is placed in operation, at which time all necessary adjustments are made.

The following temperatures should be obtained in the different compartments of the Fountain:

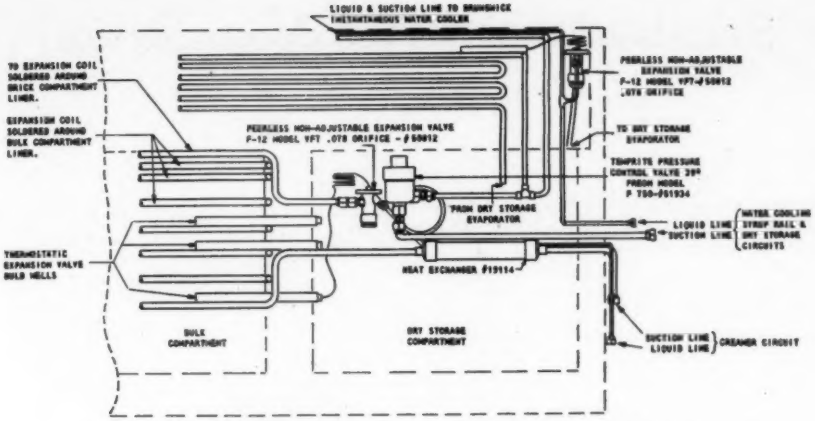

LIQUID & SUCTION LINE TO BRUNSWICK INSTANTANEOUS WATER COOLER
TO EXPANSION COIL SOLDERED AROUND BRICK COMPARTMENT LINER.
EXPANSION COIL SOLDERED AROUND BULK COMPARTMENT LINER.
PEERLESS NON-ADJUSTABLE EXPANSION VALVE F-12 MODEL VPT .070 ORIFICE - #50912
PEERLESS NON-ADJUSTABLE EXPANSION VALVE F-12 MODEL VPT-#50912 .070 ORIFICE
TO DRY STORAGE EVAPORATOR
TEMPRITE PRESSURE CONTROL VALVE 20# FREON MODEL P 730-951934
FROM DRY STORAGE EVAPORATOR
LIQUID LINE
SUCTION LINE
WATER COOLING SYRUP RAIL & DRY STORAGE CIRCUITS
THERMOSTATIC EXPANSION VALVE BULB WELLS
HEAT EXCHANGER #19114
BULK COMPARTMENT
DRY STORAGE COMPARTMENT
SUCTION LINE
LIQUID LINE
CREAMER CIRCUIT

Fig. 2—Split refrigeration circuit for the Budget and T.A. Fountain Creamers.

Bulk compartment	10°	or below	
Brick compartment	0°	or below	
Carbonated & Sweet Water	37°	to	38°
Syrup rail	50°	or less	
Dry Storage	38°	to	45°
Salad Unit (dry storage)	35°	to	40°
(water bath)	32°	to	37°
Refrigerated Back Bar Units	35°	to	40°

These temperatures should be obtained with a switch setting as given in the table below.

Refrigerant		Cut In	Cut Out
Freon			
	All bulk	20 lbs.	3 lbs.
	Brick & Bulk	20 lbs.	0 lbs.
Methyl Chloride			
	All bulk	20 lbs.	3 lbs.
	Brick & Bulk	20 lbs.	0 lbs.

To change an all bulk fountain to brick and bulk, all that will be necessary will be to change the switch settings, and the temperatures should automatically adjust themselves to the desired point.

Starting Equipment

In order to avoid overloading the condensing unit motor, the instantaneous water cooler salad unit and back bar refrigerator should be left shut off until the condensing unit has cycled and leveled off operating the creamer only. Unless this warning is heeded trouble will be experienced on starting up equipment.

After equipment has operated for a minimum of twenty-four hours, check low pressure switch setting and temperatures as shown in this article. If long runs of tubing have been installed, it may be necessary to lower switch settings slightly. Lower Cut-Out point only. Leave Cut-In point as shown, in order to get the recommended temperatures.

S S S

CONSERVING RUBBER GASKETS

HERE is an idea which will help to conserve any remaining stock of rubber door gasket material you may have on hand.

The rubber door gaskets on many of the older refrigerators wear out and get sticky very rapidly on the top corner and near the latch due to handling. Most service men make a practice of replacing the entire door gasket when only these spots are worn.

A very satisfactory job can be made by cutting out the worn piece and fitting in a new piece or a good piece from a used gasket. In this way one new gasket will repair four or five jobs at a lower cost and considerable saving of time. Besides this, it will save much needed rubber.

S S S

L. J. Zimmerman
Quincy, Ill.

I received my April issue today and was glad to get it. It sure has a lot of good things in it.

Saturday Evening Post Boosts Service

THE SATURDAY EVENING POST
MEET THE "Keep 'Em Going" MAN
There's a man in your town or neighborhood that you need more than ever today.
You need him because soon you may not be able to get a new washing machine, refrigerator or vacuum cleaner. Because America needs materials to win the war.
You need the man who can make your present appliances last.
He's the "keep 'em going" specialist—the trained service man. His knowledge and long experience can help you get all the years of service the manufacturer has built into your equipment.
Ask your appliance dealer to check up on your appliances today. A little oil or a small new part can keep them running like new. Proper care now may prevent expensive major repairs ... and help you continue to enjoy your appliances these busy days.
HAVE YOUR SERVICE MAN CHECK THESE APPLIANCES TODAY...
Automatic heating equipment
Coffee makers
Electric fans
Electric motors
Hot plates
Irons & Ironers
Mixer machines
Radios & Phonographs
Ranges
Refrigerators
Toasters & Grills
Vacuum cleaners
Waffle irons
Washers
THE SATURDAY EVENING POST

REPRINTED here is a full page ad boosting the facilities of electrical appliance service organizations. This ad appeared in the April 25 issue of the "Saturday Evening Post."

The ad points out to the owners of electrical appliances, including refrigerators, that their appliances are of greater importance than ever because shortly, new ones will not be available. It strongly urges that a serviceman be called immediately to check over the appliances and put them in order.

This ad will be read by millions throughout the country and will very likely create a surge of service business. It is run gratis by the "Saturday Evening Post" in the interest of service organizations everywhere.

Take advantage of this free promotion by one of America's most widely read publications. Secure a copy of the April 25 issue and place this ad in your window, thus identifying your store as a part of this service movement. Carry another copy with you and show it to your customer.

How Can We Refrigeration Men Help Win the War

By P. B. REED*

ALL of us, Manufacturers, Distributors, Jobbers, Dealers, Service Companies and Servicemen are anxious to do all we can to aid the War Effort. Each of us can do his individual share better by knowing what other groups can do and are doing and how we can best coordinate our work with the general effort.

This plan, though doubtless incomplete, is submitted in the hope that it may form a nucleus for further suggestions and as a start toward an industry-wide movement to conserve food, materials and labor and to use our time to the best advantage.

As a constant reminder to himself, his associates and visitors Donald M. Nelson has his slogan framed and prominently displayed in his office in Washington. We thought it so excellent and so timely that we have reprinted it here so that you can cut it out, paste it on your wall over your desk, your workbench, in your hat, in the lid of your tool kit — anywhere that it will be a constant warning that we, individually, may not do "too little, too late."

This is Donald Nelson's slogan.

A YEAR FROM NOW what will we wish we had done today?

Let us analyze by groups in our industry what those groups, and the individuals comprising them, can do today that most needs to be done to help win the war, and what we can avoid doing that may deter the war effort, lest in the future a year or a month from today, we look back on what we could have done and can only be sorry. There is more to do, less of us to do it, so we will just have to work harder and longer, avoid waste and make every lick count.

Manufacturers

Most manufacturers of refrigerating equipment are already closely connected with producing not only refrigerating equipment for the Army, Navy and Marine Corps but also for manufacturers of shells, tanks, airplanes and other war materials in the production of which refrigeration in the manufacturing processes results in more accuracy and less waste, or allows faster production. Moreover, many manufacturers of refrigerating equipment, are like ourselves, actually making planes, tanks, shells, etc., with a large part of their plant facilities and with extra shifts and are using only a part of the plant or a part of the time in the production of their own refrigeration products.

Manufacturers can help in other ways. They can use less strategic materials (found in many instances to be better) and thus save copper, tin, aluminum and other vital materials. They can point out to the distributing organizations, where and how the distributors, dealers, service companies and jobbers can best lend their experience and talents to furthering the war effort; give them sales, engineering and service help; tell them whom to contact, how refrigeration can be used to advantage, what special equipment is available, how to select the equipment, and how to install and service it.

Distributors, Dealers, Jobbers and Service Companies

Your organizations have years of experience and knowledge that, applied to the war effort, can be very helpful. Contact all your government agencies; perhaps they have refrigeration problems that are bothering them. Offer to help them in laying out their installations, in selecting the size and type of equipment and in installing and servicing it. Forget about selling them

*Service Manager, Servel Inc.

something; if you can really help them, the sales will come. Visit industrial plants, those you know are working on war orders and those you didn't realize were doing war work—you may be surprised. With your knowledge of the uses of refrigeration you may help them speed up their production, prevent a large percentage of their scrap or use their by-products. If you can do one of these, they will welcome you with open arms. The possibilities are almost unlimited. Ask us for advice on special applications with which you may have had little or no experience or for information on special equipment available.

Check over your installation and service facilities. Get your shop in order. Put in a few emergency parts. If you do not already have one, set up and keep up an installation and service record and cost system. Get as capable and industrious servicemen as you can—the best is the cheapest in the long run. Service will undoubtedly be unusually heavy this spring and summer. Get prepared for it now. Arrange to give emergency service day and night so as to lessen food lost from prolonged breakdowns. Contact users. Get them to allow you to check over the equipment and put it in good efficient order NOW before warm weather breaks and the rush begins. (You, your servicemen and the users will wish then that it had been done today!)

Servicemen

Our job in this industry is now more important than ever before. On us depends the job of keeping the machines running and running efficiently with as little waste as possible.

Installation and service of refrigeration equipment in camps, forts, air-fields, navy yards, government hospitals and agencies, plants making vital war materials and other war-connected activities have first call on our services and should be handled first and without delay. In addition, we can help by reducing waste and inefficiency in civilian refrigerating installations.

Improve your efficiency. In your spare time, study manuals, books on refrigeration, articles on new or special applications. Try the public libraries; many of them have more interesting and helpful books than you might think, from which you can get information and hints that you can use, especially on the next "tough" service call. Read new and reread old factory bulletins, file them and keep them for future reference. Read the Trade Magazines—every issue. Get a scrapbook; cut out and paste in it any articles containing interesting or useful information that you may need some time. Prepare yourself with knowledge against future need.

Prepare your tools. Clean out your tool kit. Check over your tools; clean them up and repair them, buy new ones to replace broken or badly worn tools. Buy additional tools that will save you time in the rush days and nights next summer. Check your gauges for accuracy. Get a pair of new gauges and keep them as master gauges with which to check your service gauges. If possible, get a recording pressure gauge, one hundred charts and special ink. It will watch the job while you are away doing something else. It is particularly valuable after a new installation to check operation or on complaints of high temperatures or "machine runs too much." Put on the recording pressure gauge, come back a few hours later and the chart will indicate the cause of the trouble or prove that the system is operating normally. Its value in saving of time and in enabling you to analyze what a job is doing can hardly be over-estimated. Get one today if you can possibly do so. It will pay for itself many times over.

The busy season is near. Clean up and repair any used but usable machines, blower units, leaking coils, motors, compressors or parts. Send them in to the factory now for rebuilding. They will be in demand next summer; have them ready. Go over your stock of parts, fittings and other supplies. Order a few emergency parts now, and have them on hand. Clean out your service drums; they may have dirt and scale in them; the valves may be leaking. *Send back* to the supplier any *empty cylinders* you have; *they are badly needed.*

Plan your work to save useless trips and waste of time and tires. Do every job carefully and right, so you will not have to do it over again, with the consequent waste of labor and material and perhaps spoilage of foods. Be careful to waste no materials; fittings, copper tubing and refrigerants especially. Avoid changing expansion valves, controls or other parts "on suspicion"; analyze and diagnose the trouble to the true cause. Get a vacuum pump or make one from an old compressor and motor. Draw a "no-bubble" vacuum on the system instead of purging. If necessary to remove refrigerant from a job, transfer it to a cylinder, don't purge it out to the air.

Spring check-up. Urge users to have a spring check-up made now before warm weather. On such a check-up, put on the gauges. Check discharge valves (for leak-back) and suction valves (by pumping a vacuum). If the compressor is inefficient or noisy from wear, send it to the factory for rebuilding. See that the motor is properly oiled, that the condenser on an air-cooled machine is clean and free of lint. On a water-cooled machine, clean out the condenser if a high head pressure indicates partial stoppage. See that the machine is getting an adequate supply of cool air—move the machine if necessary. See that the water valve is set to maintain an economical condensing pressure and closes tightly just after the machine stops. Check belt tension and alignment of pulleys.

Electric motors. Even now new motors are almost unobtainable without a priority rating and are obtainable promptly only on high priorities. *Motors should be given the best care possible.* Every motor should be protected by an overload relay, in addition to fuses. Small motors may be adequately protected by Fusestats. *Do not depend on fuses only.*

Take Care of Motor Troubles

If the motor is sluggish about getting up to speed, find out why—whether it is due to low voltage, a dirty or worn commutator or brushes or is due to too much load,—abnormally high suction or discharge pressure, tight belt or a tight compressor. If the motor "growls" on starting, it indicates worn bearings. Replace them before they wear enough to allow the armature to rub the laminations of the stator and burn out the windings. If the voltage seems low, have it checked; determine the cause and make correction.

Compressor oil level. Check oil level in the compressor, and if necessary, add approved oil.

Refrigerant leaks. And above all, FIND ALL LEAKS AND REPAIR THEM as soon as possible.

Teach the user how he can help. See that the user has your day and night telephone number. Instruct him in replacing fuses and what size to use and how to reset overload relays. In some instances he can save you a service call and himself money. When he calls you, find out as much as you can on the telephone. It may save you a trip back to the shop for parts you do not ordinarily have with you. Instruct him how to check and clean air-cooled condensers, oil motors, defrost coils if required, and properly arrange foods in the refrigerator, case or cooler in accordance with the temperature best suited for them, and to avoid restricting the air circulation. Most users are conservation conscious and will appreciate your advice. If they aren't, impress upon them that it is not only their duty but is to their advantage in actual saving in cost of operation and cost of service.

Our government recognizes the need for conserving the machines we now have and for conserving the power to run them. It has given special consideration to the needs of maintenance, repair and service. Let's all do our part to aid in this conservation program, and to educate users on what they too can do.

A YEAR FROM NOW WHAT WILL WE WISH WE HAD DONE TODAY?

PHILADELPHIA ELECTRICAL ASSOCIATION HOLDS CLASSES FOR SERVICE MEN TO MEET WAR CONDITIONS

A NEW educational program has been developed by the Philadelphia Electrical Association to discuss and instruct refrigerator service men in the problems arising from war-time conditions.

The classes will last 22 weeks, with weekly meetings of two hours. More than 80 commercial and domestic refrigerator service men responded to the invitation to attend the first meeting and the attendance has been steadily growing since. Maintenance of systems which were scheduled for replacement before the defense program, substitute materials, and economy in power consumption, etc., are points to be brought up, according to Carl Morash, head of the Association. Refrigerator service engineers will take up the various phases of the refrigeration field in connection with the growing service market. Refrigerator men experienced in every phase of these subjects will be invited to comment upon their experience and give whatever helpful information possible. The Commercial Electric Refrigeration Division of the Philadelphia association will sponsor each of the successive classes, according to Mr. Morash.

At the conclusion of the course, each refrigeration engineer or mechanic attending will be presented with a certificate testifying to his ability.

Service Men Eligible for New Cars Under New Rationing Order

UNDER Amendment No. 6 to the New Passenger Automobile Rationing Regulations issued April 26, it is apparent that refrigeration service men are eligible to purchase new cars after qualifying with their local rationing board.

The order specifically states that if "he must transport passengers or heavy or bulky tools or materials," he is entitled to consideration by the board.

Excerpts of the order follow:

OFFICE OF PRICE ADMINISTRATION

April 26, 1942.—In order to increase the flow of new passenger cars to eligible buyers and to assure more uniform treatment of applicants for automobile rationing certificates throughout the country, the Office of Price Administration has made changes in its automobile rationing regulations, Price Administrator Leon Henderson announced today.

This is in accordance with the administrator's express policy of releasing all new passenger automobiles, except those in the Government "pool," within a 12-month period after the beginning of rationing on March 2 of this year. Sales so far under rationing have been at a rate considerably less than was expected at the time quotas were allotted for March, April and May.

The new amendment revises completely the section of the Automobile Rationing order which requires an applicant to prove that he needs a new passenger automobile before a Local Rationing Board may issue a certificate. The applicant must still prove that he needs a car to carry on efficiently essential civilian services or war work, but the standard of need has been simplified and relaxed.

An eligible applicant may establish need for an automobile by meeting any of the following conditions:

That he must travel quickly and would be better able to do so by automobile than by other means of transportation;

That he must transport passengers or heavy or bulky tools or materials;

That without a car he would have to walk at least three miles in going to and coming from work;

That he would have to spend at least 1½ hours in going to and coming from work without a car, and could save 45 minutes by using one.

That his work is arduous, or his hours unusually long, or that he must travel late at night;

That local transportation services are over-crowded;

That his physical condition would make it a hardship for him to walk or to use public transportation facilities;

That he clearly needs an automobile because of other unusual circumstances.

If the applicant fulfills one or more of the above conditions, he may qualify for a new car purchase certificate by showing that he does not already have an automobile adequate for his purposes. A board may decide that a car is inadequate if (a) it is a 1939 or earlier model; or (b) it has been driven more than 40,000 miles; or (c) it has been rendered unserviceable by fire, collision or otherwise; or (d) it is not reliable enough for the services it is to perform; or (e) demands upon the applicant for the specified services have increased to such an extent that he needs an additional automobile to render such services.

These changes are brought about by Amendment No. 6 to the New Passenger Automobile Rationing Regulations, which is to go into effect April 29, 1942.

Commenting on the objectives of the new amendment, Mr. Henderson said: "Some eligible persons who need to replace their cars are not doing so because they believe it to be unpatriotic.

"To such people, I would like to say that there is nothing unpatriotic about replacing a car which is used to perform essential services and which would have to be replaced next year or the year after. To the extent that we can equip those who need automobiles for the performance of essential services with the best available transportation, we will be cutting costs of storage and reducing next year's automobile requirements. Those who obtain new automobiles under the rationing program have, however, a special responsibility for using their cars sparingly, for driving slowly and carefully, and for keeping their automobiles and tires in the best condition possible."

COMMERCIAL

INCREASE BUSINESS BY DOING A MORE EFFECTIVE JOB OF SELLING *Selling*

Huge Supermarket Installation May Be Last for Length of War

By Robert Latimer

The front cover of this issue shows an interior view of this supermarket and the 200 foot duct used to distribute the cooling air. The lower part of the cover shows the two 15 ton compressors installed in the basement of the market.

WHAT may well be the last large-scale installation of air conditioning and refrigeration equipment for non-defense production purposes until the war is over was completed in New Orleans March 9, when the Carrier Air Conditioning and Refrigeration Division of Higgins Industries put the final touches to equipment in the new Capitol Super Market which opened the same day.

The new supermarket, one of 15 stores operated by Capitol Stores of Baton Rouge, La., is the largest super store built in the South, with 22,000 square feet of floor space covering almost a city block of space. Included in its features is a concrete-paved parking lot for 225 automobiles, a super drugstore enclosed in the same building, huge meat market specializing in smoked meats, poultry, sea foods, separate produce department, and fixtures constructed of plywood and maple in lieu of non-obtainable metal shelving originally specified. Built expressly for operation under war conditions, the huge market has 90 employes, 45 of whom are young women whom Wallace Hamilton, general manager, is training to take over the jobs formerly held down by men now in the draft. Economy in time, costs, and labor was observed in planning every phase of the market's operation, and of course, refrigeration and air conditioning occupied an important position.

In keeping with its huge size, the Capitol Super Market has the largest air conditioning system ever installed for food-retailing purposes—and at the same time, one of the most economical. The building is cooled by two separate Carrier air conditioning systems for summer use, to which duct-type gas unit heaters, flanged into the distributing ductwork, have been added for economical heat in the short winter season. Both systems were designed to operate at minimum cost while cooling the building interior to 78 degrees at 60% relative humidity through the summer months.

The main conditioning system consists of two-fifteen-ton "step type" Carrier centrifugal compressors located in a machine room conveniently provided by utilizing the space atop a rear meat storage cooler. The two units supply Carrene refrigerant directly to two banks of coils housed in a blower chamber also located atop the cooler, with fresh air intake and evaporative condenser located on the roof immediately overhead. Cooled air is distributed through the market space by a single long diminishing-type duct down the center of the ceiling, partially concealed by covering the duct with celotex soundproof panels such as are used for the market ceiling in general. There are seven outlets on each side of the 144-foot-long duct, and return air grilles are located over the meat market, 12 feet above the floor. 20,000 cfm is circulated, with control entirely thermostatic except for a manual switch on the blower. The two gas unit heaters, located in the ductwork immediately ahead of the refrigerating coils, are likewise thermostatically controlled.

Operates in "Steps"

Maximum economy in operation is obtained by using both compressors and unit heaters in "steps"; whereby both compressors operate until the proper 78 degree temperature is reached, one cutting out at that point until an increase in the heat load requires additional cooling capacity. It is estimated by the refrigeration engineers making the installation that one compressor will efficiently cool the huge market for at least four hours of an eight hour day. Likewise, the gas heaters operate independently of each other to maintain winter temperatures economically.

The drugstore, which is a completely separate space including a luncheonette seating 61 persons, prescription, fountain and general drug departments, is cooled by a 10-ton Carrier system utilizing two five-ton compressors with a single gas unit heater for winter conditioning. Coils, blower and heater are located in a small, compact space between two locker rooms in the rear of the building, and circulate 7000 cfm at maximum capacity for the 4000 square feet of space involved. As in the market proper, cooled air is delivered in the drugstore through a semi-concealed ceiling duct with eight outlets, thermostats set to 80 degrees at 60% relative humidity concealed over merchandise shelving at the rear wall. The "step" system is also used with this smaller cooling installation, to reduce costs. Since the drugstore's trade will be largely concentrated at noon and during the evening, the cooling load is less evenly distributed.

There are also three separate storage coolers for produce, meats and delicatessen products. To save on space, and to provide for ready servicing now that each piece of equipment must last longer, the three five-ton Carrier compressors which power the cooler rooms are set up side by side in a small space at the bottom of the ladder leading to the main refrigeration equipment. Readily accessible at this location, they are nevertheless out of the way, and are substantially cooler in the reduced-temperature room.

Other equipment installed in this huge market includes seven Friedrich meat display cases, and an eight-compartment reach-in Friedrich dairy cooler. "It may be our last installation for other than war purposes for several years," Mr. Clayton said, "but we expect this job to serve as a model for lower-operating cost refrigeration and air conditioning equipment after the war is won."

Carload of Copper for Single Defense Job

ONLY two months' time—fastest installation job on record—was required by Mims Frigid Refrigeration Service Company of New Orleans in installing complete refrigeration for the Army's cold storage plant at Camp Shelby near here, where 45,000 trainees are quartered. Equipment installed included 6—50 horsepower compressors, 9 condensers, and 27 cooling units for the huge storage plant, which is built in three units for storing meat, vegetables,

and dairy produce for feeding the entire camp. Equitable Equipment Company of New Orleans furnished the equipment on a bid contract, Mims Frigid Refrigeration installing every piece in slightly less than two months with an eight-man crew.

A carload of copper tubing was used in the cold storage plant, totaling to over 1,000 joints. When all systems were tested, there were only three leaks found, according to George W. Mims, president of the New Orleans refrigeration service firm.

Commercial Specialty This Firm's Choice for War Period

New War Program Features Regular "Check-Up" Surveys

Troost Refrigeration Service Company Plans to Specialize Procurement to Meet Customer's Needs, Avoid Time Lost Looking for Replacements and Equip Shop for More Extensive Repairs

By B. K. Anderson

"YOU can't wait today until the refrigeration service job comes knocking at your door before laying out your tools and surveying your supply of replacement parts in its consideration," believes C. J. Windisch, manager, Troost Refrigeration Service Company, Kansas City, Mo.

"Rather you're going to have to anticipate these jobs in advance, keep on hand as adequate a supply as possible of new and 'renewed' parts, and keep your customer's refrigeration units operating just the same as if you were that firm's own employee,—its refrigeration service engineer on its regular payroll.

"Public health is now of more paramount importance throughout the nation than it has ever been in the past. Proper protection of perishable goods on their way to the consumer, therefore, becomes of vital importance to your commercial refrigeration customer. Now he is lending a much more interested ear to your story, that you have been telling him for years—namely, 'An ounce of prevention is worth a pound of cure'."

Certainly, to Mr. Windisch, this means selling the customer on the idea and plan of regular inspections of his commercial refrigeration equipment. In opening and presenting this service to his area, he has prepared and mailed out the following letter:

TROOST REFRIGERATION SERVICE
Domestic and Commercial Refrigeration
Air Conditioning
3945 Troost Avenue
Kansas City, Mo.

Dear Friends:

Due to priorities and shortage of material, we are experiencing some delay in securing some parts at this time and it is impossible to foresee what it might be in the near future.

We think you would be wise in making sure NOW that your equipment will be in good running order throughout the duration. Quite often some minor trouble that is not really noticeable at the present time will, if not taken care of now, develop into very serious and expensive trouble later on. Let us check your equipment now and be sure it will give you that unfailing service you expect throughout the hot summer months to come.

Our service is backed by over fifteen years of experience. Your satisfaction is guaranteed regardless of how large or small a job it might be. Hoping we can be of service to you in the near future, we wish to remain

Very truly yours,
TROOST REFRIGERATION SERVICE.

As can be seen from the letter Mr. Windisch does not, at first approach, suggest that the inspection become a regular service. He waits until personal contact to make this suggestion to the customer. The idea is to first get the customer sold on the idea of one inspection and through it show him the necessity of regular inspection during a period when replacements are uncertain at best.

For the same parts-shortage reasons, Troost Refrigeration is convinced that maintenance contracts are not a good gamble at this time and aren't making any of this type of contracts now. In its place they are featuring this inspection program and find that it not only draws this type of business but also gets them called in on many other commercial repair jobs.

As Mr. Windisch explains it: "We would rather get preventive maintenance work than repair jobs because in the former most parts can usually be repaired while in the latter the part has usually completely failed in operation and perhaps thrown something else out with it.

"Almost without exception the refrigeration service man can make more for his time on the preventive job because he can charge the customer much less for putting the equipment in top operating order and condition—a price which the customer does not mind paying nearly as much as he does a big bill made up partially of extensive replacements.

"Then there is the good-will factor to consider: If you have been servicing a customer's refrigeration on this basis for a year and he checks it against his former years, on a repair basis, your cost is almost sure to be less."

Personal contact has proved to be the most important single source of business for this service. Solicitation of the accounts begins in the immediate area around Troost Refrigeration's office and swings out in widening circles from there. Prospect cards are carried and filled out on each call. Thus the major portion of their business comes from the area immediately adjoining their place of business, which not only reduces the time necessary to get to the job but also saves driving expense.

This company's decision to throw most of its weight into the commercial repair bracket came shortly after our entry into the war when it became certain that there would be vast shortages of certain vital materials. Commercial was decided upon because it was felt first, to be of more importance in the National All Out Effort and second, because commercial customers have a better understanding of refrigeration service costs than do domestic customers.

Also the firm wanted to build up its supplies of reserve parts, both new and renewed, and didn't feel it could afford to divide its efforts "and not have enough of anything."

Now the shop's spare time is devoted to rebuilding used commercial parts that aren't readily available at the parts houses, but none of these are ever used on a job unless they can be given the same guarantee as a new part. It is always explained to a customer when a "rebuilt" part is used in his job and he is told the job would have had to wait had not the shop had this part, since none was available through local supply units.

If the cost of remanufacturing these parts is more than the cost of the part new, then the customer is charged this additional amount and it is explained to him that this was the only manner in which his refrigeration could be repaired now, without expensive loss of time to him. In most cases the customer appreciates the fact that the company is able to put his equipment in working order and does not mind this additional cost.

"We expect to have to do even more in the way of making more of our own replacement parts in the future," Mr. Windisch explains, "and are planning our shop to this end.

"Certainly this added work means that we have been forced to drop a great deal of our domestic business. Frankly, we never wanted to service anything in the domestic field except a few of the standard makes. Our policy in the past, as our domestic business began to be side-tracked for commercial jobs, was to tell the domestic customers that we weren't fully equipped to do their job and advised them

to call a firm specializing in their make.

"These domestic customers thanked us for this advice and it has helped us, in our area, to build up our reputation as commercial specialists."

A rather unique arrangement at this firm is one by which it services two areas 40 miles apart. Before coming to Kansas City several years ago, Mr. Windisch was in business in a Kansas town 40 miles distant from Kansas City. He now goes to this town on week-ends, still maintains a small shop there, and is able to add about $1,000 worth of business a year through this practice.

In Kansas City, the firm attempts to contact all commercial customers regularly within a mile radius of the shop. Balance in 1941 was 75 per cent commercial and 25 per cent domestic. The firm uses direct mail and advertising in the yellow pages of the telephone book to fill in between its personal contacts with customers.

It is Mr. Windisch's conviction that the shop that builds a good following during the War period will be the one that develops its shop to the place where it can take care of most any job without the need to wait long periods for replacement parts.

"We will have to spend a lot of time hunting around for old and used equipment to fit our needs and we aren't going to be able to wait until we get the job to start our hunting. Most of it is going to have to be done in advance. Then we're going to have to do a good job of repairing it. We must put it into new condition and be able to guarantee it.

"Shops should save all their metal and replaced parts, because much of this material can be reused, perhaps not for its former purpose, but converted to other uses. There are many problems we'll have to figure out as we go along but I'm convinced we can get by in many cases on our former waste.

"We feel there is one thing we must keep in mind today: 'The market is shifting fast, customers are buying refrigeration service instead of new units of such and such a make. It should be our greatest market, provided we plan it well enough in advance'."

Two Ton Air Conditioning System Installed in Cadillac

MOST unusual small air conditioning system ever installed in this city, a two-ton direct expansion cooling system, is making it possible for E. M. Butler, New Orleans water-purifier manufacturer, to cover a 30,000-mile sales territory during the summer months in perfect temperature conditions of 75 degrees.

Butler, who averages 30,000 miles each year in his 1941 Cadillac and previous cars, traveled 8,000 miles through arid western desert country during the hottest months of last year without a breakdown or even repairs on the two-ton Carrier compressor and direct-expansion coils which cool his five-passenger sedan.

The two-ton compressor is driven off a pulley-shaft on the V-8 engine's fan pulley, by four belts. A clutch arrangement allows for two-speed operation, one "idling speed" for use on less heated days. Two direct expansion coils are used, one mounted under the hood at the rear of the motor, the other in the rear trunk behind the back seat. One hundred per cent fresh air is brought into the car through a duct beginning in front of the automobile radiator with a scoop face, passing fresh air back through the first set of refrigerating coils, where it passes into the car through the defroster hoses, distributing evenly over the interior. Circulation continues over the back of the front seat, where the cooled air passes over the rear coil for additional cooling. An automatic damper shuts off the admission of fresh air when the proper temperature is reached. However, a lever control on the dashboard will open the air intake to guard against staleness. The lever control also operates the clutch, to slow down compressor speed for light load cooling when desired.

Five passengers in the car can smoke simultaneously without fouling the atmosphere in the car, so quickly does leakage from one window remove the stale air. Even with the window open, Butler can bring the temperature down to 65 degrees if desired.

Service Firm Builds Huge Shop to Meet War Time Demands

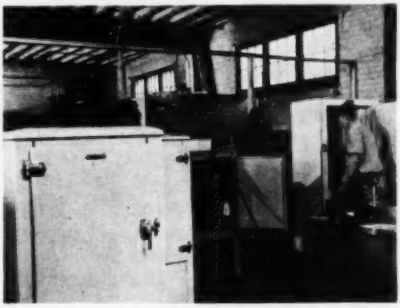
By Herbert Hanley

FROM four to eighteen servicemen in the course of a single year is the recent history of Wands, Inc., leading commercial refrigeration service firm of New Orleans, Louisiana, which has in January completed a wholesale remodelling of its building to convert from sales of domestic and commercial refrigeration to almost 100% service business.

M. T. Wetherbee, manager of the Wands concern, is one of those commercial refrigeration men who "saw the handwriting on the wall" so far as today's refrigeration service picture is concerned. Prior to January, 1941, the Wands, Inc., company split its business for the most part between sales of commercial refrigeration to meat markets, drug stores, ice plants, super markets, etc., and domestic major appliances. Sales of home refrigerators amounted to between 500 and 750 units a year, and commercial refrigeration considerably more from the dollar-volume standpoint. There were six regular salesmen, all paid a salary and commission, whose responsibilities were purely retail sales. About 80% of the store was given over to display of domestic appliances and commercial refrigeration equipment, the rest split between warehouse space, and a small refrigeration service shop with which Wands kept up warranty service on all appliances sold by the company. There were only four servicemen employed, whose principal activity was the reconditioning and refinishing of trade-in.

This section of the stock room is devoted to the storage of refrigerants, oils, belts and tubing.

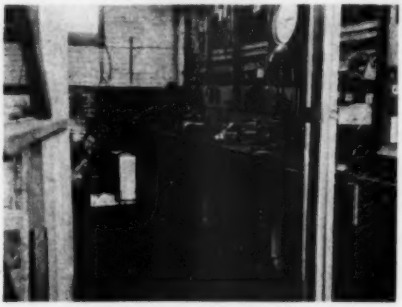
When the "phony war" of late 1940 emerged as a very serious and real conflict, Mr. Wetherbee took a number of short trips to Louisiana distributorships to "get a line" on the future of his business. As a result of this personal inspection, he became convinced that it would be impossible to sell anything like the previous year's volume in either commercial or domestic refrigeration, and as he puts it himself "decided to go whole-hog into refrigeration service for the duration." At the same time, the draft, enlistments, and government employment were taking away several key men in the company, enough to demonstrate that labor was going to be a tough problem as well.



Slack time of the men is taken up in the repair of used refrigerators in this section of the shop.

Starting in January of last year, Mr. Wetherbee remodelled the entire rear two-thirds of his building into one of the largest refrigeration service shops in the South, moving all used appliances, new equipment and other merchandise stored in this

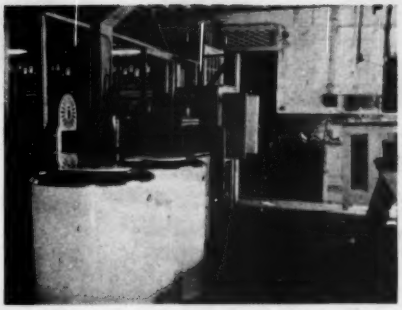
space into a separate warehouse leased two and one half blocks away. Remodelling the building cost more than $2,000, a cost which has already been depreciated in allowing for handling a larger volume of work, according to Mr. Wetherbee. Included in the new facilities are a parts department with an $11,000 inventory, a service dispatcher's office, a wood working shop, painting and refinishing shop, and complete mechanical shop for reconditioning anything from a walk-in cooler to



A great deal of attention is paid to the arrangement of electrical and mechanical repair department.

apartment-size refrigerators. The crew of six salesmen has now been cut to four, selling new and used commercial equipment only, and service where possible. Most of their business at present is sales of reconditioned equipment, which Mr. Wetherbee has been buying up from dealers without shop facilities for several months. When there are none of these left, they will sell service alone.

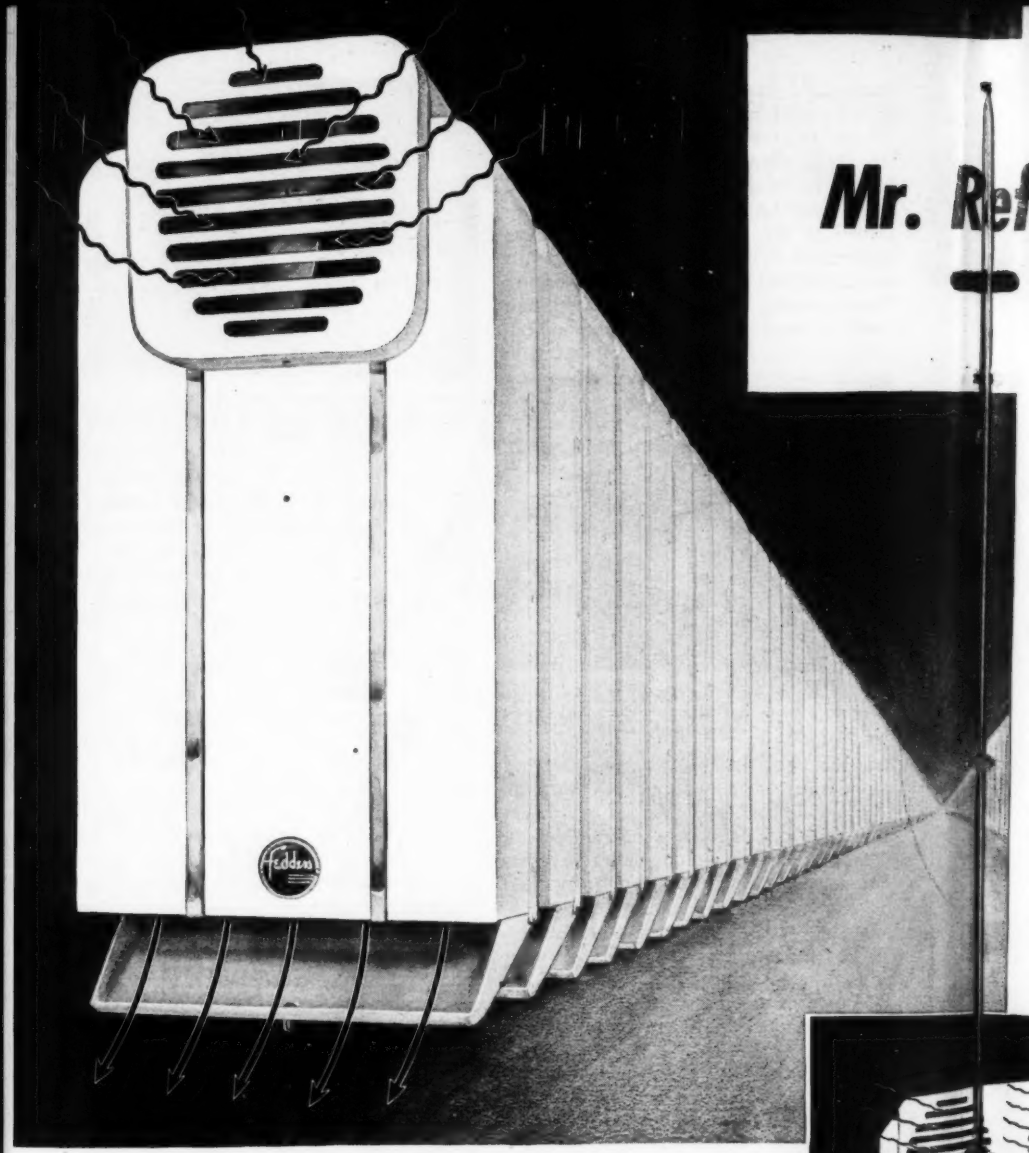
Mr. Wetherbee has been entirely serious about setting up his service department to last through the war. First, he hired an expert veteran foreman to operate this department, and put the entire job in the latter's hands. Next, he appointed a parts manager, whose sole responsibility is to maintain stocks of parts for commercial and domestic refrigeration, buying, and maintaining a perpetual inventory. At the same time, he began hiring servicemen as rapidly as they could be obtained, enlarging the service crew from four men to eighteen in one year. Keeping good servicemen has been the worst problem of all



Cabinets, deep freeze units and other fixtures leave this section ready once more for the sales floor.

—consequently, Mr. Wetherbee has seen to it that they are contented by building a shower, providing excellent lunchroom facilities, and a rate of pay commensurate with that of government projects. Most Wands, Inc., servicemen are earning between $70 and $90 a week with average overtime, and are among the best paid in the city. Four shop men repair and rebuild refrigerators, and recondition old equipment, otherwise the rest of the crew are "on the outside" receiving a $10 a week automobile allowance, and excellent pay. Wands is excepting no contract service, charging $3 for the first hour, and $2.50 an hour thereafter. This rate, while higher than in the past, has been acceptable to most customers, who realize that labor costs have gone up sharply.

Another point which aids substantially in keeping up a crew of servicemen is the "helper training plan" instituted by Mr. Wetherbee last year. Discovering that he had lost twelve men for one reason or another in six months, Mr. Wetherbee hired one helper for each experienced man on the crew, and has assigned the role of "teacher" to the latter. Helpers answer service calls, work on used equipment, do odd jobs and take care of overflow business, until they "learn the business, in a practical way." All are draft-exempt men carefully hand picked by Mr. Wetherbee, and can be depended upon to stay with the company. By summer of 1942, each helper will be qualified to handle calls on his own.



TAKE ADVANTAGE OF FEDDERS STOCK OF UNIT COOLERS

Available for Immediate Delivery

For essential civilian and direct defense installation on Priority Orders.

SEND IN YOUR ORDERS TODAY

Refrigeration Service Engineer;

Uncle Sam says, "You are in an ESSENTIAL DEFENSE BUSINESS"

He has given you the tool

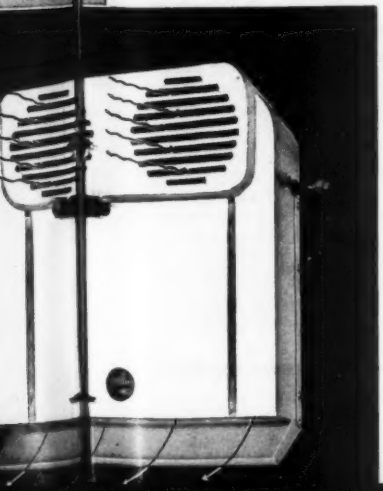
Repair and maintenance order P-126

Good food is obviously essential to the health and efficiency of America's Armed Forces and the tremendous army of production workers.

The greatest responsibility of Refrigeration Installation and Service Engineers is to keep present equipment running.

New equipment for use in Army camps, Navy barracks, hospitals and defense plants is available on priority.

Complete information on priorities is available by writing us or by asking your wholesalers.



fedders

BUFFALO, N. Y.

The Question Box

Readers are invited to send their problems pertaining to the servicing of household refrigerators and small commercial refrigerating equipment to "The Question Box."

ICE CREAM FREEZER TOO SLOW

QUESTION 485: I have a 3 hp. F-12 job hooked on an ice cream room 8 x 8 x 8 insulated with 8" cork board, all sides top and bottom. Running at —10° F., I have a Mills 5-gallon counter freezer hooked on the same compressor. This freezer was originally on a 1½ hp. compressor and froze a batch of cream in 6 to 8 minutes. On this 3 hp. it takes from 10 to 15 minutes to freeze. I have a 3 ton valve on the freezer and checked every angle and cannot shorten the freezing time. Would a heat interchanger and a back pressure regulator improve this or not?

ANSWER: You have not given me enough information about the quantity of ice cream frozen per day, nor the length of time in which this cream is frozen through which I might determine whether or not the 3 hp. Mills machine is large enough to handle this job.

I note that the ice cream room is running at a temperature of minus ten degrees. If this is room temperature and not coil temperature, it would seem you have a lower temperature than is necessary. A temperature of minus five degrees should be low enough for this room, unless you are using it as a hardening room, and I take it for granted that the room is being used for storage purposes only. You will need a coil temperature of about minus twenty degrees for the freezer; therefore, a temperature-regulating valve in the suction line of the room should help the situation and would be necessary to obtain a difference in temperature between the storage room and the freezer head.

The factory setting for the pressure switch on Mills freezers and hardening cabinets is cut-in at zero pounds, cut-out at seventeen inches.

A heat exchanger is nearly always advisable on low temperature work as an aid to increase efficiency. However, it may not offer the amount of increase necessary to speed up this freezing time the amount you desire.

Other possible causes of the lengthened freezing time are improper adjustment of the expansion valve so that the freezer is being starved of refrigerant. The valves should be adjusted so that frost appears three or four inches out of the freezer head. The temperature of the mix before it is put in the freezer may be too high. This mix should be cooled to a temperature of thirty-eight degrees before being frozen.

The freezer scraper knives may be dull or not fitting the walls of the freezer properly. If these knives are out of adjustment or are dull, a layer of cream will be permitted to remain on the walls of the freezer, thus setting up an insulation against the fast freezing required.

NORGE INEFFICIENT

QUESTION 486: I am having considerable trouble with a 1933 Norge, Model J.P., domestic box. The unit operates continuously and the cooling unit frosts up normally.

With the thermometer in the center of the cabinet, it will not pull the temperature down lower than 42°. At a room temperature of 70° the pressure in the high side is 60 and in the low 18" to 20" vacuum which, of course, is too low for its maximum pull-down, 42°. The door seal is O.K. I have run the pressure up to 70 lbs. but purged it back to 60 when I was unable to completely evacuate the evaporator. There is now no hissing noise in the float.

Suspecting a partially plugged screen in the evaporator, I examined same but found no obstruction there. I have also eliminated the possibility of moisture because the unit pulls down into a vacuum very rapidly in about 6 to 10 minutes after starting with a warm box before frost appears on the cooling unit, and frost does not form until the vacuum is about 10".

The possibility of excessive oil in the evaporator has also been eliminated because a complete pump-down should return the same to the compressor.

I'm wondering whether the float needs to be recalibrated or whether the check valve could be failing to open sufficiently; or could the trouble be caused by small traces of moisture and would like to overcome it without too much experimentation.

The unit cycles on "defrost."

ANSWER: From the symptoms you have given me, I believe that your trouble is due

WE'RE BUSY, TOO!

Our formula is just the same. The quality of materials used is still the same . . . "tops."

But . . . the demand for this liquid drier has changed. *Sales are skyrocketing!*

As we go to press with this advertisement, sales for the incomplete month of April are over 150% ahead of (2½ times) the entire month of April, 1941.

In the spirit of the times, we are glad to be doing our share for refrigeration in both the military and civilian programs, by supplying THAWZONE for preventive as well as curative purposes.

THAWZONE protects as it dries as it neutralizes.

HIGHSIDE CHEMICALS CO.
NEWARK, N. J.
195 VERONA AVE.

THAWZONE
The PIONEER FLUID DEHYDRANT

to one or both of two things: Too much oil in the evaporator or insufficient oil in the compressor. Because you have pumped this system down to zero or evacuated all the refrigerant from the evaporator is not proof that you have removed the excess oil in the evaporator because this oil will remain there even though the gas has been drawn out. In order to get that oil to return, it is better to allow the machine to operate until the evaporator is frosted, then fill the trays with hot water in order to create a violent boiling of the refrigerant in the evaporator and causing the oil to foam sufficiently to be drawn into the suction line.

Sometimes it is even necessary to loosen the evaporator from its anchor bolts and tilt it down at the back which allows the evaporator to fill up with refrigerant. Then after it is again level, the oil floating on top of this excess amount of refrigerant will be drawn into the suction line. If the system has too much oil in it, it may be that the evaporator contains too much oil now but the rollator has sufficient for proper operation. If the system has the proper amount of oil the evaporator is probably holding some of the oil which causes it to operate inefficiently and because the compressor will be operating short of oil, it, too, will be operating inefficiently.

These compressors require sufficient oil so that the pump itself is submerged in order to obtain efficient operation. If this oil is pumped over into the evaporator, both the evaporator and the rollator will operate inefficiently. It may be by getting the oil to return to the compressor through the method I have described that your troubles will be over. However, it is possible that there is some other difficulty which is causing this oil to leave the compressor.

One of the possibilities of this trouble is that the check valve is leaking which would permit the refrigerant and oil to be forced back to the suction line from the compressor to the evaporator during the off cycle. Another possibility, as mentioned before, is that the system contains too much oil and it is being pumped over from the compressor.

GAS CHARGED VALVES

Question 487: My question pertains to the Detroit Lubricator (Adjustable Superheat) thermostatic expansion valves.

I have a valve from Detroit Lubricator marked M-10 which is designed for low temperature. Is it possible for me to readjust this valve so that I can use it satisfactorily in a fixture of approximately 36° F., providing that its B.t.u. capacity is proper?

Answer: The number M-10 designates the refrigerant used and the maximum outlet pressure of the valve.

In other words, this valve is a gas charged power element and is intended for maximum back pressure of ten pounds. For this reason the valve will not operate satisfactorily on higher temperature applications. The back pressure on your system would never be permitted to rise above ten pounds and, of course, the system would operate inefficiently under these conditions where a temperature of 36° is required.

No adjustment can be made on the valve to increase this pressure because the gas charge is limited to that mark on the valve.

BRUNSWICK-CREAMER FOUNTAIN

Question 488: I was called on to service a Brunswick-Creamer soda fountain recently. The ice cream compartment was not cold enough, and in testing I found it low on gas. Installing a liquid line indicator I proceeded to add gas until the indicator showed there was enough in the system. I added more gas than I know the system would use, but the indicator still showed there was not enough in the system, and the suction line started to frost back. I took out some of the gas, which is F-12, and the frost back stopped.

I left the machine that night and the next morning the ice cream was solid, but the liquid line indicator still showed it was low on gas. By turning off the service valves on the Temprite instantaneous water cooler, it caused the machine to turn off and on which, according to the owner, had not done but very little since it was installed, and the liquid line indicator showed plenty of gas in the system.

The compressor is a one-horse Brunswick-Creamer and used a surge tank in the suction line. The Temprite water cooler does not use expansion valves but uses a Temprite control valve in the suction line. The principle of this is what I do not quite understand, and I would like it explained to me.

I was wondering if the trouble could be in the Temprite water cooler. It seems the gas is rushing through the cooler which causes the machine to run more than it should and the liquid indicator to show it is low on gas.

The job is only about one year old.

Answer: At first glance, the symptoms mentioned seem to be contradictory. How-

There's a WAR to be won!

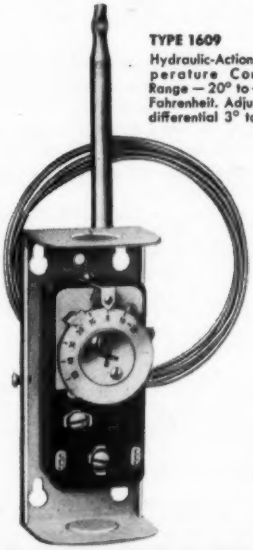
AND CONSERVATION OF MATERIALS AND MANPOWER IS ESSENTIAL

★

Perhaps you can't get everything you need today . . . or tomorrow either. Neither can we.

But that's part of the job of winning a war . . . and while it lasts we'll all make the best of our time and the quantity of materials we are able to procure.

TYPE 1531
Low-side Pressure Control. Range, 25 inches of vacuum to 50 lbs.—adjustable differential, 5 to 35 lbs.



TYPE 1609
Hydraulic-Action Temperature Control. Range — 20° to + 50° Fahrenheit. Adjustable differential 3° to 25°.

Today . . . when you can get priorities and allocations . . . you'll save more man-power by letting White-Rodgers' clearly calibrated dials eliminate guesswork and repeated gauge-testing . . . by letting their accurate performance reduce service calls . . . and by using their flexible mounting facilities to conserve installation time.

★

HYDRAULIC ACTION CONTROL

WHITE-RODGERS ELECTRIC CO.
1203e CASS AVENUE • SAINT LOUIS, MISSOURI
Controls for Heating • Refrigeration • Air-Conditioning

ever, it must be remembered that the Temprite water cooler is a flooded evaporator which means that it has a needle valve operated by a float. If the refrigerant rushes through the cooler as you claim, it is due to one or both of two causes: 1. Not enough refrigerant in the system. If the liquid level is low, it will not raise the float and close the valve; consequently, the gas keeps rushing through the open needle valve. 2. Leaking needle valve. The most common symptom of this trouble is the frosting back on the suction line to the compressor.

Assuming that the job is merely short of refrigerant, adding refrigerant until the float closes will remedy the trouble and there will be no frost back on the suction line. If the job is short of refrigerant and the needle valve leaks, the job will begin to frost back after a certain amount of refrigerant has been added.

The float valve may be sticking open, dirt or some other foreign object may be holding it open, or the needle or seat (or both) may be pitted. In any of these cases, the valve will not close. If the valve is leaking only slightly, it will result in a longer running time of the machine and possibly a slight frost back, but there will still be a certain amount of refrigeration. If the leak is very bad, the demand for liquid is greater than the capacity of the condensing unit is to supply it. The result is that the refrigerant is not completely condensed and the sight glass would indicate small bubbles, which might lead the service man to believe that the job was short of refrigerant. This is one case in which the sight glass apparently does not tell the truth.

The suction pressure regulating valve on the side of the Temprite merely closes at a predetermined point so that the suction pressure (and consequently, the temperature) cannot go low enough to freeze the water.

P-126 Is New Repair Order

(Continued from page 12)

The A-8 rating is used for emergency service to *any* existing refrigerating and air conditioning equipment as well as to expedite the deliveries for repair parts to maintain an emergency service inventory in the refrigeration service agency.

Endorsements

In the use of these orders it is necessary that each order issued using the preference ratings shall be endorsed to the wholesaler or supplier or the equipment as follows: "Preference Rating A ..... is applied hereto under Preference Rating Order No. P-126, Serial No. ..... with the terms of which order the undersigned is familiar and under which the undersigned is authorized to operate by a certificate No. ..... which has not been revoked."

The name of the service agency immediately follows this statement endorsed by an official of the service agency.

It will be necessary for the wholesaler or the jobber to be shown a copy of the order assigning the serial number to the service company, and if purchases are made from several sources of supply, it will be advisable to have photostatic copies of the order assigning the serial furnished to such suppliers with the first order under P-126.

The preference rating prohibits the use of preference ratings from being used for certain critical materials as outlined in subparagraph 2, paragraph (d). The P-126 Order cannot be used for the expansion of existing refrigeration plant and no materials can be secured for the conversion of one refrigerant to another.

The full contents of the order follows:

WAR PRODUCTION BOARD
DIVISION OF INDUSTRY OPERATIONS
PREFERENCE RATING ORDER
No. P-126

MATERIAL FOR EMERGENCY SERVICING OF REFRIGERATING AND AIR CONDITIONING MACHINERY AND EQUIPMENT

NAME OF EMERGENCY SERVICE AGENCY:
ADDRESS:
SERIAL NO. DATE:

Preference Rating Order P-126. For the purpose of facilitating the acquisition of Materials for the Emergency Servicing of Refrigerating and Air Conditioning Equipment (as hereinafter defined), preference ratings are hereby assigned to deliveries of such Materials upon the terms hereinafter set forth;

(a) *Definitions.* For the purposes of this Order

(1) "Refrigerating and Air Conditioning Equipment" means any type of machinery, equipment or other apparatus (except a domestic mechanical refrigerator) which is primarily designed to lower the temperature of matter, or to regulate the temperature or humidity of air, by mechanical, chemical or physical means, together with all insulated enclosures, materials, parts, implements and devices used with such machinery, equipment or apparatus in causing it to perform its function of refrigeration or air conditioning.

(2) "Emergency Service" means the emergency repair of a refrigerating or air conditioning system (excluding any domestic mechanical refrigerator) which is actually installed, the condition of which

ENLISTED!

To keep the commercial refrigeration equipment of our nation in efficient operation is a war-time assignment of first line importance. It means wholesome, healthful food for military and civilian population, and the avoidance of spoilage waste.

Refrigeration service men are enlisted for the duration in this vital task. And Penn is enlisted with them. In addition to our direct work for the armed forces we are prepared to furnish controls... on priority orders... for both existing and new equipment required to preserve the nation's food supply. For assurance of efficient operation depend on Penn automatic controls.

Penn Electric Switch Co., Goshen, Indiana.

PENN
CONTROLS

renders its operation unsafe or ineffective, including the replacement or reconditioning of necessary parts therefor, whether or not a breakdown has actually occurred. It includes the emergency replacement of equipment which has been worn out, damaged, or destroyed, but does not include the installation of any equipment (new or used) to replace usable equipment or the substitution of equipment of inherently greater capacity than that which it is necessary to replace.

(3) "Emergency Service Agency" means any person (or functioning unit of a person) customarily engaged in the rendering of Emergency Service and regularly authorized to represent a manufacturer, owner, or lessee of refrigerating and air conditioning equipment, provided that such person (or functioning unit) shall have received a serial number from the War Production Board in accordance with the provisions of subparagraph (e) (1) hereof.

(4) "Emergency Service Inventory" means the minimum inventory of material required to supply current demands for emergency service. Such minimum inventory shall not exceed the maximum physical quantities of similar items on hand, for similar purposes, on the date of any physical inventory taken in the year 1941. Separate dates for different items may not be chosen.

(5) "Material" means any commodity, equipment, accessory, part, assembly, or product to be used in connection with any emergency service or emergency service inventory except chlorinated hydrocarbon refrigerants.

(6) "Delivery of Material" means the furnishing of facilities for the repair or reconditioning of refrigerating and air-conditioning equipment, or any parts used therewith, as well as the physical delivery of any material.

(7) "Supplier" means any person with whom a purchase order or contract has been placed by an Emergency Service Agency or by another Supplier for the delivery of material required for emergency service or emergency service inventory.

(b) *Assignment of Preference Ratings.* Subject to the terms of this Order, and of any Conservation or Limitation Order issued, or to be issued hereafter, the following preference ratings are hereby assigned, but nothing herein contained shall prevent the use of any other or higher rating to which any person shall be entitled by reason of any other preference rating certificate or Order:

(1) A-1-a to deliveries of material to an Emergency Service Agency for emergency service when, and only when, there has been an actual breakdown of refrigerating or air-conditioning equipment

(i) used primarily for the processing, transportation and storage of food and dairy products for the Army or Navy of the United States or the United States Maritime Commission;

(ii) in cold storage warehouses;

(iii) in meat-packing houses under the inspection of the United States Government;

(iv) in blast furnaces.

(2) A-3 to deliveries of material to an Emergency Service Agency for emergency service

(i) to avert an immediately threatened breakdown or suspension of operation of any types of refrigerating or air-conditioning equipment coming under the provisions of subparagraph (b)(1), or

(ii) when, and only when, there has been an actual breakdown of refrigerating or air-conditioning equipment used

(*a*) for the processing, transportation or storage of food and dairy products, (except when coming under the provisions of subparagraph (b)(1), including (but not limited to) all such equipment in retail establishments where food is sold or served, but excluding domestic mechanical refrigerators; or

(*b*) in manufacturing plants (other than blast furnaces) actually engaged in manufacturing products under a Defense Order as defined in Priorities Regulation No. 1, where the proper functioning of such equipment is necessary to the completion of such Defense Order.

(3) A-8 to deliveries of material to an Emergency Service Agency

(i) to avert an immediately threatened breakdown or suspension of operation of any types of refrigerating and air-conditioning equipment coming under the provisions of subparagraph (b)(2)(ii),

(ii) for emergency service to all other refrigerating and air-conditioning equipment (except any domestic mechanical refrigerator), and

(iii) when such deliveries are needed to maintain an emergency service inventory.

(c) *Persons Entitled to Apply Preference Ratings.* The preference ratings hereby assigned may, in the manner and to the extent hereby authorized, be applied by

(1) an Emergency Service Agency;

(2) any Supplier of material to the delivery of which a preference rating has been applied as provided in paragraph (e).

(d) *Restrictions on Use of Ratings.*

(1) A Supplier may extend any preference ratings assigned under this Order subject to the following conditions (and subject to the conditions stated in subparagraph (d)(2);

(i) No supplier may apply the ratings to obtain Material in greater quantities or on earlier dates than required to enable him to make on schedule a delivery rated hereunder or to replace in his inventory Material so delivered. He shall not be deemed to require such Material if he can make his rated delivery and still retain a practicable working minimum inventory thereof; and if, in making such delivery, he reduces his inventory below such minimum, he may apply the ratings only to the extent necessary to restore his inventory to such minimum.

(ii) A Supplier may defer applications of the ratings hereunder to purchase orders or contracts for Material to be placed by him until he can place a purchase order or contract for the minimum quantity procurable on his customary terms; *provided,* that he shall not defer the application of any rating for more than three months after he becomes entitled to apply it.

(2) The preference ratings hereby assigned shall not be applied

(i) to obtain any copper, copper base alloy, stainless steel or alloy steel for use in the manufacture of any material to the delivery of which preference ratings may be applied under this Order, or to replace in the inventory of a manufacturer any copper, copper base alloy, stainless steel or alloy steel used in the manufacture of any such Material;

(ii) to obtain any block tin pipe, unless an equal quantity of scrap tin pipe is returned to the fabricator;

(iii) to obtain any babbitt metal containing more than 12% by weight of tin;

(iv) to obtain any solder containing more than 30% by weight of tin;

(v) to obtain Material which can be secured when required without such ratings;

(vi) to obtain deliveries greater in quantity, or on dates earlier, than reasonably necessary for emergency service, or emergency service inventory requirements of the Emergency Service Agency;

(vii) to obtain scarce material the use of which could be eliminated without serious loss of efficiency by substitution of less scarce material or by change of design;

(viii) to aid in the conversion of an existing refrigerating system from the use of one refrigerant to another;

(ix) to obtain parts, including (but not limited to) the following for installation with new refrigerating or air-conditioning equipment, or for replacement (other than emergency replacement), or for the expansion of existing facilities;

(*a*) automatic controls, either domestic or commercial;

(*b*) copper tubing or fittings;

(*c*) copper tubing or pipe for the manufacture or "winding" of "low sides," or pipe for the manufacture of coils;

Doing Double Duty
● Refrigeration valves, fittings and accessories will, in all probability, be doing double duty for many months to come. In the meantime, it is of the utmost importance that those products which you can procure are dependable and will function for the "long haul".
If you are in difficulties, write us. We will do our very utmost to help.
Mueller Brass Co. products have a reputation for quality and long life.
MUELLER
BRASS CO.
PORT HURON, MICH.

(d) suction or liquid line valves whether operated manually, thermostatically, or by pressure;
(e) water control valves whether operated electrically or by pressure;
(f) expansion valves of any description;
(g) complete "low sides" of any classification, including water coolers, carbonated water coolers, and malt beverage coolers;
(h) copper tubing for the fabrication of water or beverage cooling "low sides";
(i) complete "high sides" with or without controls and with or without a motor;
(j) component parts of "high sides" for assembly into a complete unit;
(k) electric motors or
(l) "flash-type" baffles for the modernization of existing installations.

(e) *Restrictions upon Application of Preference Ratings.*

(1) An emergency Service Agency shall not apply any preference ratings assigned by paragraph (b) until he

(i) shall have filed with the War Production Board a statement (in triplicate) properly executed, on Form PD-399; and

(ii) shall have received from the War Production Board, a serial number which shall thereafter be endorsed on all purchase orders or contracts for material placed by him which are rated pursuant to this Order.

(2) An Emergency Service Agency, in order to apply the preference ratings assigned hereunder to deliveries to him, must endorse on the original and all copies of each purchase order or contract which is covered by the ratings assigned hereunder, a statement in the following form manually, or as provided in Priorities Regulation No. 7, signed by an official duly authorized for such purpose;

"Preference Rating A- is applied hereto under Preference Rating Order No. P-126, Serial No. , with the terms of which Order the undersigned is familiar, and under which the undersigned is authorized to operate by Certificate No. which has not been revoked.

(Name of Emergency Service Agency)

By .....
(Duly Authorized Official)"

(3) A supplier in order to apply the preference ratings assigned hereunder to deliveries to him must endorse on the original and all copies of each purchase order or contract which is covered by the ratings assigned hereunder, a statement in the following form manually, or as provided in Priorities Regulation No. 7, signed by an official duly authorized for such purposes;

"Preference Rating A- is applied hereto under Preference Rating Order No. P-126, Serial No.(s).

The undersigned is familiar with the terms of this Order *and has seen the certificate(s) of authority, or properly authenticated copy(ies) thereof, of the Emergency Service Agency(ies) operating under the above Serial Number(s).*

.....
(Name of Supplier)

By .....
(Duly Authorized Official)"

.....

(A Supplier need not add the italic words in the foregoing endorsement unless he delivers the Material directly to an Emergency Service Agency.)

(4) An Endorsement in the form of subparagraphs (2) or (3) above shall constitute a representation to the War Production Board and the Supplier with whom the purchase order or contract is placed that such purchase order or contract is duly rated in accordance herewith. Such Supplier shall be entitled to rely on such representations, unless he knows or has reason to believe it to be false. Any such purchase order or contract shall be restricted to Material the delivery of which is rated in accordance herewith.

(5) A Supplier who has received from two or more Emergency Service Agencies or Suppliers endorsed purchase orders or contracts for Material to the delivery of which the same rating has been applied in accordance with this Order, may (within the limitations of paragraph (d) hereof) include in a single purchase order or contract any or all of the material which he in turn requires to make such rated deliveries, but must specify in the endorsement on such single purchase order or contract all of the Serial Numbers contained in the purchase orders or contracts which have been so received by him to fill which he is applying the preference rating.

(f) *Records.* An Emergency Service Agency shall retain for two years for inspection by duly authorized representatives of the War Production Board endorsed copies of all purchase orders or contracts placed by him to which he applied the preference ratings assigned hereunder, and also a separate record of each service job in the performance of which he used materials or equipment rated under this Order, including the names and addresses of all his customers with a list of parts and material used on each job. Each Supplier shall also retain for a period of at least two years, for inspection by representatives of the War Production Board endorsed copies of all purchase orders or contracts received by him and rated under this Order, whether accepted or rejected.

(g) *Reports.* Each Emergency Service Agency and each Supplier shall file with the War Production Board such reports as said Board shall from time to time request.

(h) *Communications.* All reports which may be required to be filed hereunder, and all communications concerning this Order, shall, unless otherwise directed, be addressed to:

"War Production Board
Washington, D.C. Ref. P-126"

(i) *Violations.* Any person who wilfully violates any provision of this Order or who by any act or omission falsifies records to be kept or information to be furnished pursuant to this Order may be prohibited from receiving further deliveries of any material subject to allocation, and such further action may be taken as is deemed appropriate including a recommendation for prosecution under Section 35 (A) of the Criminal Code (18 U.S.C. 80).

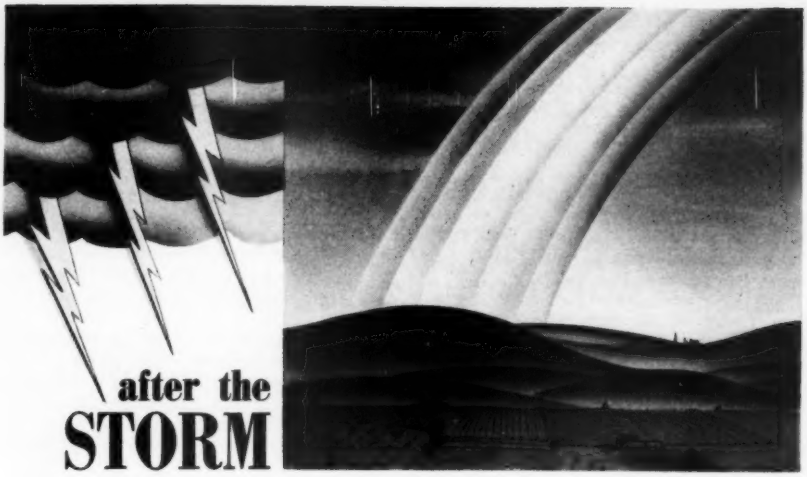
(j) *Revocation or Amendment.* This Order may be revoked or amended at any time as to any Emergency Service Agency or any Supplier. In the event of revocation deliveries already rated pursuant to the provisions of this Order shall be completed in accordance with said rating, unless the rating has been specifically revoked with respect thereto. No additional applications of the rating to any other deliveries shall thereafter be made by the Emergency Service Agency or Supplier affected by such revocation.

(k) *Applicability of Priorities Regulation No. 1.* This Order and all transactions affected thereby are subject to the provisions of Priorities Regulation No. 1 as amended from time to time, except to the extent that any provision of this Order may be inconsistent therewith, in which case such provision shall govern.

(l) *Effective Date.* This Order shall take effect on the date specified in the heading hereof, and unless sooner revoked, shall expire on the 30th day of June, 1942.

Issued this 20th day of April, 1942.

J. S. Knowlson
Director of Industry Operations



after the STORM

★ ★ ★ ★ ★ **the rainbow** ★ ★

AMERICA is finally awakening to the reality of war—total war—war on a scale so vast that it baffles the imagination. Its grim reality is being felt in millions of homes as the cream of our youth and manhood answers the call to the colors, and luxuries, comforts, and even necessities are denied to civilians.

Now, most of us are beginning to realize the seriousness of the emergency. Before it is over, our very right to survive may be tested to the breaking point by our fortitude and willingness to make sacrifices.

We at Henry Valve Co. are happy that our peacetime products are useful to many branches of the government in prosecuting the war to eventual victory. Much as we regret our inability to supply the demands of many of our customers—the only job that matters now is the *winning of the war*.

But even war has some compensations. Under pressure of necessity, science and inventiveness respond with supreme effort and with lasting benefit to mankind of the future. Out of this struggle will come new methods, new materials, new products—to make a better world.

Many new ideas are being developed in our laboratory. When war-time restrictions are lifted, refrigeration and air conditioning will enjoy the benefits of more Henry "firsts."

HENRY VALVE CO

HENRY

VALVE CO. • 1001-19 N. SPAULDING AVENUE • CHICAGO

PACKLESS AND PACKED VALVES · STRAINERS · DRYERS FOR REFRIGERATION AND AIR CONDITIONING · ALSO AMMONIA VALVES AND FORGED STEEL FITTINGS

IRON AND STEEL BAN HITS SOME REFRIGERATION ITEMS

THOUSANDS of manufacturing plants were ordered by the War Production Board to stop using iron and steel in the manufacture of more than 400 common civilian products.

The list of products to be banned includes such common iron and steel items as bathtubs, pie plates, cash registers, waste baskets, cigarette lighters, clock cases, mail boxes and fountain pens.

The sweeping order—General Conservation Order M-126—affects not only the manufacturing plants but also thousands of wholesalers, distributors, jobbers, retailers, employees in all these businesses and the consuming public.

Limited production is permitted for 90 days, but after that manufacture must stop, even for many items customarily used by the armed forces.

Manufacturers have 15 days to deliver or accept delivery of iron and steel to be used in the manufacture of any of the products listed in the order. For 45 days iron and steel may be processed for the manufacture of the items listed, up to an aggregate weight of 75 percent of the average monthly weight of all metals processed by each manufacturer during 1941 in the making of each item. The processing must be completed within the 45 days. For the next 45 days he may assemble items on the list. After that date all use of iron or steel in the manufacture of items on List A of the order must cease.

Manufacturers who have been making items on the list out of iron or steel may not turn to any other metal except gold or silver to make that article. During the 90-day period when fabrication and assemblage is permitted manufacturers may sell iron and steel to others engaged in the same line of business. They may not sell iron and steel from inventory otherwise except on preference ratings of A-10 or higher for other than alloy steel and A-1-k or higher for alloy; to the Metals Reserve Company or its agencies or with the specific authorization of the Director of Industry Operations.

Included in the list which will be suspended under the order is the following related refrigeration equipment:

Air Conditioning systems—except for hospital operating rooms and industrial plants. (Maintenance and repair services are excepted.)

Electric water coolers—except on PD-1A or PD-3A certificates.

Ice box exteriors except portable blood banks.

Ice cream freezers, household.

Ice cube trays.

Insulation, metal reflecting type.

Refrigerator containers and trays, household.

POWER LIMITATION ORDER EXEMPTS FOOD REFRIGERATION

THE War Production Board set up machinery to handle power shortages wherever and whenever they occur in this country.

It issued an Order (L-94) of nation-wide application which may affect every user of electric power in the country. In some areas shortages of electric power have already occurred, and in others further shortages are threatened. These shortages are generally caused by the vast increase in use of electric power by war industries, causing many systems to use their reserves in current operations, and reduce their margin in the event of breakdown, drought, fuel shortages, or other unfavorable conditions.

The purpose of the Order is to assure a steady flow of power to war industries and essential civilian services by curtailing non-essential uses. Curtailment of electricity for regular consumers, however, will not take place until an area becomes a power shortage area.

Two main lines of action against power shortages are set out in the order. The first, which goes into operation at once, requires utilities to operate their systems in a way that will produce the maximum amount of power from their present capacity. In general, this calls for integrating or tying together the systems to permit transfer of power from one locality to another where the power is needed most.

The second part of the program, which will be put into operation when and where a shortage occurs, establishes machinery for mandatory curtailment of power for commercial and industrial consumers. Provision is also made for curtailment of residential consumers.

Specifically mentioned in the Order under *Restricted Uses* is refrigeration for air conditioning except where essential for industrial processes.

Likewise the list of *exceptions* to any regulation of the Order includes under the following essential community services: Hospitals, schools, *refrigeration for food preservation plants.*

YOURS

IS AN IMPORTANT RESPONSIBILITY "*FOR THE DURATION*"

NEVER BEFORE has it been so important for refrigeration and air conditioning dealers and service shops to "hang-on" as it is today. WITH YOU lies the responsibility of maintaining the refrigeration and air conditioning equipment of this entire country *for the duration.* It is you who will be depended upon to keep equipment, varying from a few months old to 12 and 15 years old . . . in dependable operating condition.

★ You can't let these responsibilities slide any more than our brave troops would turn tail to the enemy.

★ Essential to your best efforts will be genuinely dependable, serviceable parts—and you know from experience that Kerotest Valves and Fittings are easy to install, long wearing and completely dependable. Because you and the equipment you service so well are dependent on reliable parts, we at Kerotest are doing everything within our power to make genuine Kerotest Valves and Fittings available for every essential refrigeration and air conditioning requirement.

★

★ KEROTEST

KEROTEST MANUFACTURING CO.

PITTSBURGH, PA.

G.E. WILL APPOINT RETAILERS AS APPLIANCE SERVICE CENTERS

A STREAMLINED appliance service plan designed to improve service facilities to the consumer, and at the same time to cooperate fully with WPB's material conservation effort by conserving replacement parts for use in making essential replacements only, was announced and interpreted by W. C. Noll, G.E. appliance service manager, during a three-day conference of G.E. appliance and merchandise department executives, district managers and product service men April 20, 21 and 22 in Bridgeport, Conn.

The plan applies to all G.E. household appliances, both major and traffic, with the exception of furnaces, air conditioning and radio.

Regional Appliance Service Centers

The plan calls for the establishment of G.E. owned regional appliance service centers in various sections of the country, each regional center serving as a pool of replacement parts and repair facilities for several distributorships. Regional appliance service centers are now being established in San Francisco, Boston and Atlanta. Others will follow.

It was clearly explained at the Bridgeport conference that the new plan need not interfere in any way with already well established and smoothly functioning distributor service facilities. Functions of the regional appliance service center will vary in accordance with the particular problems and requirements of the areas which they serve. Some distributors, particularly in metropolitan areas, may call on the appliance service center for parts only. Other distributors will encourage their appliance service center dealerships (qualified servicing dealers) to make use of the regional appliance service center not only for parts, but also for service facilities over and above the standard services performed by qualified dealerships.

Each distributor within service distance of the regional appliance service center will have the advantage of a more complete stock of replacement parts than he might have been able to maintain, and he will not be required to have a large investment tied up in parts.

A dealership authorized as a local G.E. appliance service center will be identified by a sign or a decalcomania. This will establish his store as the headquarters for service on practically all appliances, plus complete service information and cooperation on any G.E. appliance he does not handle.

Some of the requirements which must be met by a dealer before he can qualify as a local G.E. appliance service center are the following: (1) maintain adequate trained personnel; (2) maintain an adequate stock of supply parts on all products which he services; (3) maintain a repair shop equipped to make minimum standard repairs; (4) maintain installation and service records; (5) maintain and keep up-to-date a complete file of G.E. service manuals, price lists and catalogs; (6) courteously handle calls for service he is not equipped to render (this means either sub-letting the service job to the nearest qualified shop, or furnishing complete information to the customer on the nearest qualified repair station); (7) adequately identify his store as a headquarters for G.E. service and to thoroughly establish this identification through advertising; (8) equip all service personnel with an adequate supply of tools.

Rebuilding Sealed Units

General Electric's primary purpose in the new service plan, according to Mr. Noll, is to supply "restored service" to customers whose appliances fail during the war emergency. G.E. is not interested in rebuilding for indiscriminate resale old refrigerator units that may be lying around in warehouses in quantity. However, the company is asking the cooperation of dealers and distributors in turning over to the factory old non-working refrigerator units. The company regards these units, and all service parts and rebuilding facilities, as precious things which must be reserved for actually restoring service to customers who suffer from an appliance breakdown.

When a sealed unit fails, the dealer sending it in for rebuilding must furnish the name of the customer, and must certify that it is being rebuilt to restore service in the customer's home.

Rebuilding of sealed refrigerator units requires factory equipment, and this job is too big even for the regional appliance service centers. The five G.E. owned factory rebuilding centers which have been regularly operating in Long Island City, Cleveland, Sch'dy, Kansas City and San Francisco, will continue to handle rebuilding jobs.

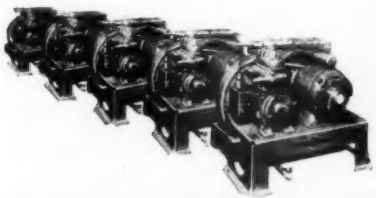
What YOU can do to help SPEED WAR PRODUCTION

In the many plants now operating two and three shifts, wear and tear on refrigeration and air conditioning equipment has been increased greatly. Breakdowns are bound to be more frequent—and more damaging in holding up the steady flow of production.

You can help speed war production by installing additional G-E "Scotch Giant" condensing units to be held in reserve for emergencies. These reserves can be put in use from time to time so you can service the regular units—helping to *prevent* breakdowns and to keep production going full speed.

You can help, too, by inspecting operating equipment regularly, by stocking spare parts, and by responding promptly to service calls.

And here's still another way to help: Contact war plants where G-E "Scotch Giant" condensing units are *not* used. Suggest installations to improve war products, speed production, reduce spoilage.



A wide range of capacities

General Electric "Scotch Giant" condensing units are available in a wide range of air cooled and water cooled models in ratings from ¼ to 125 horsepower. They are designed to provide economical operation for industrial processing, food preservation, and other cooling needs. General Electric Co., Div. 2715, Bloomfield, New Jersey.

TURN TO

GENERAL ELECTRIC

"Scotch Giant" Condensing Units

Program for Victory

Refrigeration and air-conditioning organizations endorse conservation plan.

A VOLUNTARY conservation plan which can be a notable contribution to the Nation's wartime effort has been announced as the Refrigeration and Air-Conditioning Industry's PROGRAM FOR VICTORY, and already has the endorsement of twelve leading organizations in the industry —The American Society of Refrigerating Engineers, Refrigeration Service Engineers Society, Air Conditioning and Refrigeration Machinery Association, Association of Refrigerated Warehouses, Commercial Refrigerators Manufacturers Association, National Frozen Food Locker Association, Inc., National Association of Ice Industries, National Association of Practical Refrigerating Engineers, Practical Refrigeration Engineers Association, National Refrigeration Supply Jobbers Association, Refrigeration Equipment Manufacturers Association, and the Standard Refrigeration Compressor Association.

Preliminary two-color folders will be distributed by the A.S.R.E. to other cooperating societies and to companies in the industry, and the plan will be presented by Dr. Hainsworth at the All Industry Meeting in Chicago, May 11.

A.S.R.E. officers have announced that they have merely started the ball rolling, and that they are aware that many companies and individuals in the field are already following the suggestions outlined. They urge every man in refrigeration and air conditioning to support the VICTORY PROGRAM 100 per cent, since only by industry-wide support will it be a large-scale contribution to the successful prosecution of the war.

The complete text of the Refrigeration and Air-Conditioning Industry's PROGRAM FOR VICTORY follows:

A Wartime Message to every member of the Refrigeration and Air-Conditioning Industry.

The months ahead are critical months for America—critical months in Democracy's war to assure freedom and decency and tolerance for all of us and for our children.

You of the Refrigeration and Air-Conditioning Industry are doing a splendid job of providing and keeping in condition much-needed equipment for men and plants who are supplying armaments to our fighting forces.

You're the men behind the guns! And we're proud of you.

But, America needs more help from you. Building a bridge of bombers across the Atlantic—throwing a wall of tanks into the fray—sending out more and more ships of war . . . all this demands materials and metals in quantities never dreamed of before.

You can help provide these materials—steel and copper and other metals—by helping America CONSERVE. That, in a nutshell, is the object of your industry's "Program for Victory"—to SAVE . . . SIMPLIFY . . . SUBSTITUTE.

Specifically, this program calls on you to avoid every waste of essential materials and supplies. To make the most of existing equipment. To collect reclaimable metal for wartime use. To reduce the number of models now being produced. To release vital war metals by finding substitutes. To cooperate in all possible ways with governmental agencies in the conservation of equipment, materials and power.

The Refrigeration and Air-Conditioning Industry has already demonstrated its patriotism. It will not falter on this new assignment.

I pledge to CONSERVE FOR VICTORY—SAVE . . . SIMPLIFY . . . SUBSTITUTE . . .

If a refrigeration or air-conditioning manufacturer, I will . . .

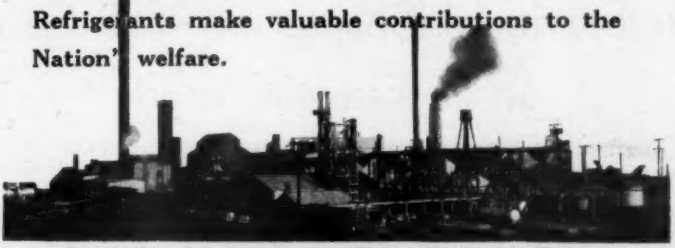
1. Use substitutes for critical materials. Eliminate waste and promote systematic maintenance.
2. Standardize equipment, test methods and practice. Simplify product line.
3. Urge users to make full use of service facilities to keep equipment in order.
4. Assist distributors' service organizations and jobbers with engineering and service help on this wartime program.
5. Seek out usable condensing units, fittings and other materials and use in place of new products.
6. Research to find new applications to further the war effort.

REFRIGERATION HAS COME A LONG WAY

1824—Sadi Carnot established the ideal Carnot heat cycle in a closed and reversible process, in which the fundamental principles of isothermal and adiabatic expansion and compression are shown very clearly. Recognizing the true nature of heat, he set forth the principle now called "the second law of thermodynamics" which governs every chemical reaction and nearly every phenomenon in the physical universe.

NICOLAS LEONHARD SADI CARNOT
1796—1832

1942 The whole theory and practicability of present-day mechanical refrigeration rests squarely on the laws of thermodynamics, involving heat exchange by expansion and compression. Thanks to America's enterprising refrigeration industry, our nation in war and in peace enjoys better food, greater comfort. In war and in peace, Virginia Refrigerants make valuable contributions to the Nation's welfare.



General View of the Manufacturing Plant at West Norfolk, Virginia

"VIRGINIA" REFRIGERANTS
AGENTS FOR KINETIC'S "FREON-12"
VIRGINIA SMELTING CO.
WEST NORFOLK, VIRGINIA

7. Prepare for air raids. Emphasize air raid instructions on refrigerating equipment.

If a distributor, dealer or jobber, I will . . .

1. Use my experience to conserve equipment and materials. Select proper sizes and types of equipment for most efficient use.

2. Speed up war production by refrigeration processes. There are many such applications. Discover new ones.

3. Check over installation and service facilities. Put my shop in order.

4. Employ capable, experienced and industrious service men. Encourage their training.

5. Urge users to have their refrigeration equipment checked and put in good order.

6. Take inventory of idle refrigeration equipment, valves, fittings and other materials. Use this equipment in new installations or broadcast its availability.

7. Arrange to give emergency service.

If an operator, maintenance or service engineer, I will . . .

1. Keep machines running efficiently and smoothly. Check performance. Conserve electricity, fuel and power.

2. Find all leaks and repair them as soon as possible. Be sure not to add refrigerant until leak is found and repaired. If necessary, remove refrigerant and transfer it to an approved container. Avoid purging to the air. Check shaft seal. Tighten gasket joints.

3. Check compressor oil level. Oil motor bearings and keep them oiled.

4. Keep motors operating efficiently. Clean commutators and brushes. Replace badly worn bearings.

5. Check belt alignment and tension. Conserve rubber.

6. Blow off condenser surface on air cooled machines. Be sure that air supply is adequate.

7. Clean condensers on water-cooled machines. Be sure there is no partial stoppage. Be sure that the water valve is set to maintain economical condensing pressure. Clean regulating valve and strainers.

8. Check insulation for moisture, deterioration and tightness. Replace if defective.

9. Make certain that tools and equipment are in good order. Clean and check tool kit.

10. Check stock of parts, fittings and supplies.

11. Return empty refrigerant cylinders to suppliers without delay.

12. Give prompt service. Be sure of the diagnosis of trouble. Avoid guesswork. Plan work to save time and tires. Concentrate effort. Avoid repeat calls. Study service manuals and information supplied by manufacturers.

13. Check expansion valve if crankcase runs cold.

14. Remove oil from rubber mounting blocks.

15. Clean evaporator surface.

16. Advertise and publicize my ability and desire to aid in the wartime program.

17. Instruct users in procedure in an emergency.

Interprovincial Chapter of RSES Carries on an Essential Work

THE Interprovincial Chapter of the Refrigeration Service Engineers Society located in Toronto, Canada, is made up of representatives from each chapter in Canada. It serves as a headquarters for all chapters in Canada in much the same way as the State Associations serve various states in the United States.

Organized since war was declared, they have become the official representative of the entire service industry in Canada and have carried on a much needed work.

Following much the same pattern of services performed by the International Society headquarters in Chicago, the Interprovincial Chapter has provided the service industry with representation on the Advisory Council of the War Board in Ottawa. It has kept members and non-members alike posted on Government regulations, suggestions on obtaining supplies, the use of A-10 rating under order P-100 and information pertaining to gasoline rationing.

All this has been done through the regular issuance of bulletins by the chapter. How much this work is appreciated is indicated by the many letters received by the chapter from those on its mailing list.

MEET *All* INSTALLATION CODES

Weatherhead valves, fittings and accessories are made to meet the refrigeration codes of all cities.

Valves include angle, two-way, three-way packless, compressor, by-pass, check, receiver tank and relief types.

Fittings have an exclusive flat-sided construction that provides no slip—no strip—no leak installations.

Accessories include pipe flanges, adapters, receivers, charging hose, manifolds and testing valves, all finely machine finished.

THE WEATHERHEAD CO.

300 East 131st Street
CLEVELAND, OHIO

WEATHERHEAD

Refrigeration Valves, Fittings and Accessories

Thus far most of the expense of this service has been borne by the Ontario Maple Leaf Chapter, but because this chapter's finances are limited, it is felt the recipients of the service would be willing to help financially so they may continue to receive the information. With this thought in mind donations are to be requested in the amount of $1.00 for R.S.E.S. members and $2.00 for non-members.

Going out with this request is a questionnaire with space for the name and address, company affiliations, member status, suggestions and a list of others interested. From the questionnaires returned together with a donation will be compiled a new mailing list for future bulletins. The old list will then be destroyed.

* * *

R.S.E.S. Chapter Notes

COLUMBUS CHAPTER

April 17—Announcement was made by J. B. Merkel of final arrangements for the certificate examination to be held at the May meeting. Due to their inability to attend the Chicago convention, C. Toothaker and R. J. Creamer resigned as delegate and alternate delegate. Appointed in their place was P. A. Oberly, Delegate, and R. R. Dunlap, Alternate Delegate. Each member turned in a question on a refrigeration problem which provided the meat of the evening discussions. After the meeting was over, a smelt fry was enjoyed by all those in attendance. It was through the courtesy of Ansul Chemical Company and Williams and Company which made this possible.

KANSAS CITY CHAPTER

March 24—The meeting was held in the home of A. M. Hoover and was called to order by President Smith. The application of C. L. Brown was received and voted on and Mr. Brown was recommended as a member to the chapter. The balance of the evening was devoted to business matters and the meeting was adjourned at an early hour.

BOSTON CHAPTER

April 14—The meeting was held at the Smith House and presided over by Gerald Bradford, President of the chapter. A brief report was given by the Secretary on the meetings of the Advisory Committee in Washington held April 2. Some discussion followed on the proposed repair order. On the educational program, Mr. Seddon, chairman of the committee, introduced Mr. Carl J. Holinger of Fountain Service, Inc., who has designed a number of units for automatically dispensing carbonated beverages in paper cups. Mr. Holinger illustrated his talk with a movie of these units and their component parts providing a most interesting evening for all in attendance. He wound up his talk with thanks to the group for the opportunity of attending, stating that the assistance he had received from the refrigeration field had made him grateful to such organizations. Refreshments were served following the meeting.

MILE HIGH CHAPTER

April 13—Vice-president McCombs took charge of the meeting in the absence of the chapter president. The committee appointed to design a sign for members' cars and trucks reported that they had been informed by the police department that metal signs were not permissible, but that signs could be painted on the cars and trucks from a stencil. It was therefore decided to have a stencil made which members could use for this purpose. The stencil would be sent to whomever needed it and each member would pay for his own painting. A report from the annual dance showed that a good time was had by everyone and that a profit was made from the proceeds. The balance of the evening was spent in discussing the new government order in which a great deal of interest was shown and while no interpretations were forthcoming at the moment, it was felt that the order was satisfactory. Refreshments were served after the meeting.

DAYTON CHAPTER

March 26—The meeting took the form of a party at the home of George Click, president of the chapter. Everyone enjoyed themselves to the fullest extent and departed at a late hour.

April 9—On the educational program of this evening, Mr. Snyder, of Westinghouse, presented two sound films. The first was on the proper use of the refrigerator and the second was on the proper method of cooking to prevent the loss of vitamins.

ONTARIO MAPLE LEAF CHAPTER

March 27—The meeting opened with a good deal of discussion on the parts situation of the day, also a report from Mr. Ken

Superior PRODUCTS ★ ★ ★

★ ★ ★ FOR YOUR *Defense* JOBS

Increased refrigerated space for the accelerated production of perishable foods places a heavy responsibility upon the refrigeration industry. Shortage of metals condemns waste and inefficiency. Do your part to conserve materials. Design to produce more refrigeration per watt hour. Select equipment which requires a minimum of service. Specify SUPERIOR — the quality buy-word of the industry.

CUT OUT AND SAVE FOR FUTURE REFERENCE

DIAPHRAGM PACKLESS VALVES

Entire internal assembly removable for soldering or inspection. Equipped with famous pressure cup below diaphragm. Two and three way. Flare sizes ¼" to ¾"; Sweat sizes ¼" to ⅞".

PACKED AND PRESSURE CUP VALVES

Flare and sweat sizes ¼" to ⅝" (two and three way) have hex seal cap. Sweat sizes ¼" to 2⅛" (globe) have wing nut seal cap. Internal assembly (all sizes) removable for sweating to valve body.

★ *Refrigeration is Vitally Essential to Our National Defense Efforts* ★

CHECK VALVES

Very sensitive springs. Less than 5 ounces pressure drop. Positively will not chatter or hum. All internal parts easily removable for sweating or inspection. Sizes ¼" to ¾" Flare; ¼" to ⅞" Sweat.

LIQUID INDICATORS

With or without seal cap. Flare sizes ¼" to ⅝"; Sweat sizes ¼" to 1⅜". On ⅛" Sweat to 1⅜" entire upper assembly may be removed as a unit to facilitate soldering of refrigerant lines to connections.

★ *Refrigeration-Food Preservation and National Defense are Synonomous* ★

DEHYDRATORS

Silica-Gel or Activated Alumina. Refillable and non-refillable. ¼" to ⅝"; ⅛ to 5 H.P.; 2 to 60 cubic inches.

MANIFOLDS

With packless or seal cap valves. Two to six valves; ¼" to 2⅛" valves, with or without end fittings. Sweat or flare.

FILTERS

Highly efficient sock type filter. Sizes ¼" SAE to ⅝" SAE. One to five horsepower.

★ *Don't take chances with the Nation's Health -- do the best job possible* ★

FITTINGS

Unions, adapters, elbows, tees, crosses, caps, etc. ⅛" through 1".

HEAT EXCHANGERS

Unique design gives highest capacity per unit size! Sweat or flare connections. 4200 to 9725 BTU per hour.

Combination Heat Exchanger and Accumulator. From one to ten tons. Especially recommended for low temperature installations.

FLARE NUTS

Brass and steel. Long end frost proof. Forged and bar stock.

★ **For complete details—see your Jobber or write for catalog** ★

SUPERIOR VALVE & FITTINGS CO.

★ PITTSBURGH ★ PENNSYLVANIA ★

TRENTON CHAPTER ANNUAL BANQUET

On April 13th, the Trenton Chapter held their third annual banquet, concluding a year of activity. The dinner proved to be a great success, with 76 in attendance. Harry Klingler acted as toastmaster.

Charles Logan, Vice-President of the American Society of Refrigerating Engineers, spoke on the importance of refrigeration to the National Defense Program. Israel Kramer of the Kramer Trenton Company, praised the servicemen of Trenton on their activities and their willingness to cooperate.

Tribute was paid to the outgoing officers and the new officers of the coming fiscal year were installed. They are: President, Franklyn Beemish; 1st Vice-Pres., Louis Gershenfield; 2nd Vice-Pres., George Rooks; Secretary, Raymond Pental; Treasurer, Frank Sujansky; Corresponding Sec'y, S. Charles Segal; Sgt. at Arms, Louis Louria. The evening was concluded in the gayety of singing and dancing.

Wood, outlining the delegation's activities during their visit to Ottawa. Mr. Marshall was then called to introduce the speaker of the evening, Bill Weaver. Mr. Weaver gave an interesting talk dealing with labor, parts shortage and the problem of pooling service calls and outlined why, in the future, it would become necessary for various departments of our service to get together and work in harmony in order to eliminate unnecessary waste of gas and rubber which would naturally occur through the overlapping of service calls. This point brought up the problem of repeat collections and it was suggested that a list be left in the secretary's hands covering doubtful collections which could be referred to by service men, thus saving them considerable time, money and effort in handling these accounts. There was also the question of utilizing old parts which, by now, has become a definite necessity.

Mr. Nye followed Mr. Weaver with some comments on pooling of calls and Mr. Lock made a motion to the effect that the chapter go further into this problem. Mr. Marshall then suggested that it might become necessary to zone the city of Toronto in order to allocate certain sections to certain individuals. Mr. Weaver also brought up the point that in Detroit servicemen were maintaining an office in which one girl was capable of handling calls and bookkeeping for 160 operators in that city. In this way, one central point was utilized for service calls and the calls were zoned from that office.

April 10—Under the heading of new business, Ken Wood stated that he had been thinking of the advisability of voluntary enlistment in the army reserve instead of waiting until most of the men were called. He suggested some consideration should be given this subject. Ken Wood was then appointed to investigate further into the requirements of the Reserve Army Corps. During a discussion on the parts situation, it was found that the members were becoming somewhat confused by the many interpretations offered. It was suggested that instead of getting too involved with the items which concerned manufacturers and jobbers only that the discussion should be conducted from a serviceman's standpoint. Therefore, Bert Nye, Wallace Smallwood and Mr. McCracken were delegated to answer all questions on the subject. From there on the discussion seemed to progress with less confusion and much more was learned. Among the things brought out in the evening was that the repair order had been amended to include stores and restaurants, that parts

Service is in the Balance

THE OLD ADAGE, "A product is only as good as the service it renders," is trite in normal times. During the present emergency it is taking on added significance.

New refrigerating units and refrigerators are going to be increasingly difficult to obtain—our country's production facilities must be turned primarily toward the one great purpose—to defeat our enemies.

Because the Tecumseh Products Company has always stressed the manufacture of precision-built compressors and condensing units, the added years of trouble-free service are extra insurance to the Chieftain user. And, after long years of faithful service, the Chieftain unit may be repaired with genuine Chieftain exact replacement parts. Or the Chieftain compressor body may be rebuilt, "good as new," in our factory at nominal cost.

Chieftain will take care of its users during the emergency.

TECUMSEH PRODUCTS CO. TECUMSEH, MICHIGAN

Chieftain

were becoming increasingly scarce and hard to get, that some jobbers and outlets were refusing to sell unless the order was accompanied with a serial number. Mr. McCracken urged all servicemen to make application immediately for their serial number on PD-304. The door prize of $2.00 in cash went to Art Smith.

IMPERIAL RECEIVES ORDNANCE FLAG

THE Imperial Brass Manufacturing Co., Chicago, received the coveted Army Ordnance Flag on Army Day, April 6. The presentation was made by Lt. Samuel Pace of the Chicago Ordnance District to Mr. Frank McNellis, president.

In a message from Col. D. Armstrong, Deputy District Chief of the Chicago Ordnance District, the employees were asked to continue to assist in every way possible toward making the war program a success. The brief ceremonies were broadcast over the company's loud speaker system to all office and factory employees.

Imperial Products are used on Army and Navy aircraft, naval vessels, army motorized equipment, in Army cantonments and Naval bases, and by many plants making vital defense products.

WHITE-RODGERS EXPLOSION-PROOF THERMOSTATS

A NEW explosion-proof thermostat is announced by White-Rodgers Electric Company, St. Louis, Missouri, and is now available for heating, refrigerating and air conditioning installations where hazardous conditions exist. Explosions and fires can cause serious set-backs to high speed wartime production and the introduction of these controls is particularly important at this time.

White-Rodgers explosion-proof thermostats are line voltage, hydraulic action controls. They are obtainable in either self-contained or remote bulb types. External knob or tamper-proof internal adjustments are available in both fixed and variable differential types. The entire control is enclosed in a semi-steel case approved by Underwriters' Laboratories.

They are especially recommended for use in oil refineries, munitions plants, cleaning plants and similar locations. They are available in standard ranges to cover any type of application.

E. W. McGOVERN NOW MANAGER OF SOLVENTS DIVISION

THE R. & H. Chemicals Department of E. I. du Pont de Nemours & Company announces the following personnel changes involving its Solvent and Chlorine Products Divisions:

Edward W. McGovern, from the Chlorine Products Division to be Manager of the Solvents Division.

Nelson C. Cooper, from the Solvents Division to the Chlorine Products Division.

M. Marean, formerly Manager of the Solvents Division, to be Assistant to the Director of Sales.

Mr. McGovern joined the Roessler and Hasslacher Company in 1929, and this company was merged with Du Pont in 1930. He had experience in research, development and production before he was made technical representative for refrigerants, chlorine and chlorinated hydrocarbons in 1934. A native of Bethlehem, Pennsylvania, he received a degree in Chemical Engineering from Lehigh University in 1928, and a Master of Science Degree in 1929. Mr. McGovern is married, has two daughters, and makes his home in Wilmington.

Mr. Cooper has worked on the development of synthetic dry cleaning fluids since he joined Du Pont in 1930. Prior to that he was with Niagara Alkali Company. A native of Ontario, Canada, he was graduated from Queen's University. He is married, has one daughter and lives in Wilmington.

HUBBELL JOINS THE NAVY

OUR Nation's fighting forces gained a valuable man in Howard H. Hubbell of Brass & Copper Sales Company of St. Louis. At the same time the refrigeration supply industry lost one of its most progressive and forceful members.

Mr. Hubbell volunteered and has been commissioned as a Lieutenant Commander in the United States Navy, where his initial duty will be to serve as an instructor of midshipmen in the Department of Marine Engineering at the United States Naval Academy at Annapolis.

Mr. Hubbell graduated from the Academy at Annapolis in 1920 and served for four years thereafter in the fleet on the "high seas" going around the world in the course of regular duty. In 1924 Howard resigned and soon after was one of the founders of the Brass & Copper Sales Company.

Those in the N.R.S.J.A. who have worked

WHEN IT'S DAY AND NIGHT IT'S EASY!

FOR CIVILIAN NEEDS:
Insulated Tank Coolers, such as Model CE-25 shown below, are available for prompt shipment on non-defense projects.

Tank Cooler can be mounted under counter, on wall or ceiling. Any conventional type of glass or pitcher filler can be used, located for convenient access.

FOR DEFENSE NEEDS:
"Day & Night" supplies Storage Type Water Coolers to meet U. S. Army and Navy Specifications.

FOR MAINTENANCE:
Parts for maintenance and repairs are available under proper Preference Rating Order.

Write for your copy of Bulletin No. 47.

DAY AND NIGHT COOLER DIVISION
DAY & NIGHT MFG. CO.
2320 EAST EIGHTH STREET · LOS ANGELES, CALIFORNIA
FACTORY REPRESENTATIVES
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Warehouse Stocks at Convenient Shipping Points

It's up to you to KEEP 'EM RUNNING

Every service job done satisfactorily with no call backs is YOUR job in the victory program.
Herveen can help you.

HERVEEN

to SERVICE METER-MISERS

Herveen is the ideal replacement gas for servicing Frigidaire Meter-Misers. Many service men have solved their Meter-Miser servicing by using Herveen gas. Today Uncle Sam depends upon you to do the very best job you can to "keep 'em running."

No priorities on Herveen as yet — if your wholesaler does not stock Herveen—write us.

MODERN GAS CO., Inc.
Manufacturers and Refiners
1084 Bedford Ave., Brooklyn, N. Y.

TODAY—MORE THAN EVER BEFORE

—you NEED the "RECALIBRATOR"

IN these days when it is difficult to get any kind of equipment, you have all the more reason for making certain that the equipment you DO get will handle its job properly. In gauges and dial thermometers this means Marsh—instruments with the "Recalibrator."

Any gauge or dial thermometer can be knocked out of adjustment. But if its a Marsh instrument with the "Recalibrator," the twist of a screwdriver restores it to complete accuracy at every point on the dial. The "Recalibrator" doesn't merely compensate for error—it actually eliminates the source of error. It's your best defense against the jars and jolts of service work for years to come.

JAS. P. MARSH CORP., 2059 Southport Ave., Chicago, Ill.

• The "Recalibrator" is available on all Marsh Gauges—standard on all Marsh Dial Thermometers. It is typical of the advanced design, the helpful features you'll find throughout the broad Marsh line—all products of 75 years of specialization. Write for refrigeration catalog.

MARSH

Refrigeration Instruments

with Howard Hubbell will miss him a great deal. There is a war to be won, however, and we know that he will do his part to see that it is won.

* * *

A. D. ROSE NOW ASST. MANAGER OF JAS. P. MARSH CORP.

A NEW post has been created in Jas. P. Marsh Corporation of Chicago to take care of enlarged activities.

A. D. Rose, for many years sales manager, has become Assistant General Manager, and the position he has vacated will be filled by James Emmett, Jr., formerly Assistant Sales Manager. "Al" Rose and "Jim" Emmett are well known in the refrigeration industry.

* * *

NEW CATALOGS AND BULLETINS

THE WEATHERHEAD COMPANY of Cleveland, announce a new issue of the company's catalog of refrigeration parts.

This new catalog is compiled in accordance with the specifications adopted by the National Refrigeration Jobber Association and the Refrigeration Equipment Manufacturers Association. An additional feature is the listing of fittings and small parts under standard package items.

New products listed include a solder type packless valve, wrought copper solder fittings and open face sight glass indicators. The refrigeration Division of The Weatherhead Company will gladly send copies of the catalog to those interested.

* * *

Classified Ads

Rate: Two Dollars for fifty words or less. 30 cents for each additional ten words or less.

Available at once—serviceman. Installation, service, repair all types equipment, carbonator and fountains especially. Must be year around proposition. Have complete equipment and service truck. Good references. Address Box M-1, Refrigeration Service Engineer, 435 N. Waller Ave., Chicago.

KEY to Our SERVICE

LARGE STOCKS

Careful attention to your orders for

REFRIGERATION

and

Air Conditioning PARTS and Supplies

THE HARRY ALTER CO.

1728 S. MICHIGAN AVENUE, CHICAGO, ILLINOIS

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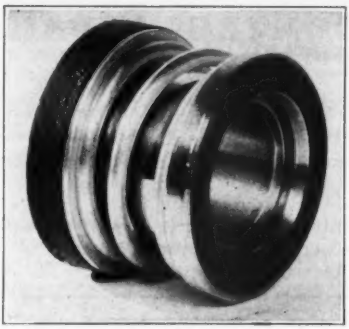

When Other Seals Fail Try

SYNTRON

"ANTI-FRICTION"

SHAFT SEALS

ON NEW—AS WELL AS ON OLD, WORN AND SCORED SHAFTS.

A Complete Line.

See Your Jobber.

SYNTRON CO., HOMER CITY, PA.

Serving the Midwest!

DEALERS AND SERVICEMEN — buy from an M.R.S. Jobber—he handles the best lines, the most complete stocks, offers you quick, convenient service right in your own territory. Same day or overnight delivery. Low prices.

Write to jobber nearest you for Refrigeration Supply catalog.

Brass & Copper Sales Company
2817 LaClede Avenue
St. Louis, Missouri

Dennis Refrigeration Supply
Sioux City, Iowa
Cedar Rapids, Iowa
Des Moines, Iowa

Hoffman Supply Company
812 Boonville
Springfield, Missouri

Iowa Radio Corporation
1212 Grand Avenue
Des Moines, Iowa

National Refrigeration Parts
510 Water Street
Sioux City, Iowa

Refrigeration Equipment Company
101 E. 24th Street
Kansas City, Missouri

Refrigeration & Industrial Supply Company
422 S. 7th Street
Minneapolis, Minnesota

Republic Electric Company
114—1st Street
Davenport, Iowa

Ruegg Refrigeration Supply
223 N. 25th Street
Omaha, Nebraska

Vincent Brass & Copper Company
100 N. 2nd Street
Minneapolis, Minnesota

Winterbottom Supply Company
Commercial & Miles
Waterloo, Iowa

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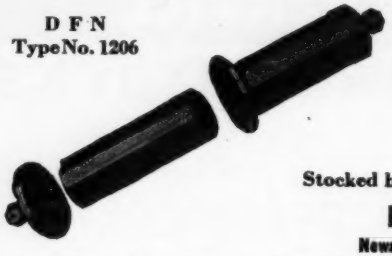
Type No. 1206



A single cartridge demountable assembly of the
D F N SYSTEM
for the control of moisture, sediment and acid.
ASK FOR CAT. R-7.

Stocked by leading jobbers for your convenience.

McINTIRE CONNECTOR CO.
Newark New Jersey

COLD CONTROLS & EXPANSION VALVES
repaired or exchanged
at the following prices, F.O.B. Chicago

Automatic Expansion Valves (All Makes)	$1.50
Thermostatic Expansion Valves	3.25
Automatic Water Valves	2.50
Domestic Cold Controls (Modern Type)	2.50
Commercial Controls (Temp. or Pressure)	2.75
Commercial Dual Controls	3.25

ALL WORK GUARANTEED FOR 90 DAYS
Write for quantity prices
NEW DUTY
2424 Irving Park Blvd., CHICAGO

WET REFRIGERATORS ARE UNSANITARY

Reco Refrigerator Circulators dry them up quickly. Dissipate odors and prevent ice on coils. Help your customers and make money for yourself by installing them. Write for liberal dealer's proposition.

REYNOLDS CIRCULATOR COMPANY
2674 W. Congress Street
Chicago, Ill.

DOLE
VACUUM PLATE
COOLING and FREEZING UNITS
C H I C A G O

CONTROL REPAIR SERVICE

Domestic Controls reconditioned equal to new at a small cost. All work guaranteed for one year. Prices upon request.

United Speedometer Repair Co. Inc.
342 W. 70th Street
New York City

WATER REGULATORS
Pressure-actuated, renewable seat, ⅜", ½", ¾" pipe fittings.

SHUT-OFF VALVES
Semi-steel, carbon-steel, double-seated stem, Angle and Globe type.

ALL STEEL GAUGE SETS
Safety ball seats shut off liquid in case of glass breakage.

DEHYDRATORS
Furnished filled with Calcium Chloride, Activated Alumina, or Drierite and Silica Gel.

STRAINERS
Cylinder and Cone types, and liquid line scale trap.

ALL-STEEL LINE VALVES
Compact in design, completely rustproof, Angle, Tee and Globe types.

CYRUS SHANK COMPANY
625 West Jackson Blvd. Chicago, Illinois

WHEN YOU'RE AT THE CONVENTION — DROP IN AT *"AUTOMATIC"*

We're less than a mile from convention headquarters—conveniently reached. You may be sure that we'd welcome your visit. Come in—let's get acquainted.

Write Dept. WK for our complete 1942 catalog. Ready for distribution now.

Automatic
HEATING & COOLING SUPPLY CO.
647 WEST LAKE STREET CHICAGO, ILLINOIS

Many items are still available without priority —but to insure immediate delivery sign an A-10 or higher where possible.

Find Leaks Quickly
with
JUSTRITE
Refrigerant Gas Leak
DETECTOR

Efficient and economical for locating leaks in systems using Freon, Carrene, or other non-combustible gases. Simple, easy to operate. Leaking gas turns flame bright blue providing instant detection. Self generating — no pumps. Burns gasoline, benzine, or naphtha.

Blow Torch and Soldering Iron

Remove hose and you have a powerful blow torch. Attach tip and you have an efficient soldering iron.

JUSTRITE MANUFACTURING COMPANY
2695 Southport Ave. Chicago, Ill.

USE

FOR DRYING AIR REFRIGERANTS INDUSTRIAL GASES

DRIERITE is an Efficient, Rapid, Economical Dryer for all the Modern Refrigerants. Dries both by Chemical Action and Adsorption.

Used in Dehydrators by leading manufacturers and furnished to the Service Engineer by leading Supply Dealers.

Write for literature.

W. A. HAMMOND DRIERITE CO.
YELLOW SPRINGS, OHIO

HERMETIC REBUILDING

One of the largest hermetic rebuilding plants in the United States. Refrigeration units, parts and supplies. General Electric, Westinghouse, Grunow, Majestic, Crosley, Frigidaire, Norge, Kelvinator, and others. Write for catalog on your letterhead.

Service Parts Company
25th Ave. and Lake St., Melrose Park, Ill.

PRACTICAL

ATTENTION! SERVICE MEN

Practical Instruments

WILL SIMPLIFY YOUR WORK

Service work is easy and certain . . . when you use these portable recording instruments:

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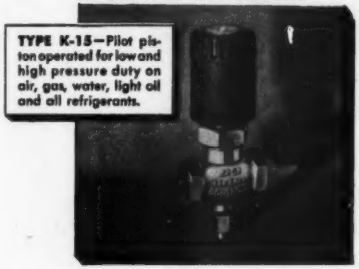

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